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ORIGINAL COMMUNICATIONS.

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THE INTRANASAL ETHMOID AND FRONTAL SINUS OPERATION. TECHNIQUE. REPORT OF CASES.*

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What is the present status of the intranasal ethmoid and frontal sinus operation? A review of literature made covering the last four to five years fails to reveal any new or very useful contributions to our armamentorium, in either the management or operative technique of intranasal surgery of the sinuses in general and the ethmoid and frontal sinuses in particular.

The chasm that exists between the old-time conservative and more modern radical surgeon is still very wide and deep.

The operative technique of the intranasal ethmoid and frontal sinus operation is still a much debated question, and holds no little interest to the student in rhinology. Opinion is divided chiefly on the question as to what degree or extent an operative procedure should be carried both in the destruction and conservation of normal and pathological tissues in and adjacent to the field of operation. Hence the opinion of some, that the mere uncapping of the ethmoid labyrinth to permit ventilation and drainage is sufficient to cure an ethmoiditis. While still others hold that a thorough exenteration of all diseased tissues in and about the ethmoid labyrinth is essential in order to obtain a cure.

The middle turbinate bone is still a much discussed subject. There are those who believe that a part or the whole of it must be sacrificed in order to make a successful ethmoidectomy or resection of the

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floor of the frontal sinus possible. While others believe in preserving the middle turbinate bone as an essential organ and use it as a guide throughout the operative work; these observers point very convincingly to the indiscriminate removal of the middle turbinate as a cause of a great many disagreeable conditions which follow during the postoperative period.

Another question discussed is whether or not it is necessary to do a submucous resection of the nasal septum preliminary to an ethmoid or frontal sinus operation.

In this communication I desire to describe a method of procedure and technique in the treatment of suppuration of the ethmoid and frontal sinuses which to my mind surpasses any of the other methods in use at the present time. Although not absolutely new, having been in use abroad for many years, it has been rather sadly overlooked or neglected for no good reason in this country.

Several years ago while working with Dr. Max Hallé at his private clinic in Berlin, I became very much engrossed in his intranasal operations on the sinuses, particularly the ethmoid and frontal sinus operations. After performing these operations on several patients at his clinic and subsequently on a series of cases here in my hospital and private practice I became more than convinced that the intranasal ethmoid and frontal sinus operation of Hallé are the operations of choice and are to be preferred, with slight modifications, to any other method or technique in use at the present time.

To properly understand and appreciate the value of this operation a thorough understanding of the anatomy of the parts involved is most essential. An intelligent understanding and interpretation of the physiology and function of all intranasal structures is also very necessary. In performing this operation one not only strives for results which will terminate in a cure, but for one that will leave all intranasal structures intact and in as normal a state as may be possible. On examining a case immediately after operation, it will be at times difficult to tell whether or not an operation has been performed, so little damage has been done to the nasal mucosa.

One of the most important and essential features in this operation is the preservation of the entire middle turbinate body. It appears that the consensus of opinion in this country is, that a sacrifice of part or the whole of the middle turbinate is an absolute necessity in order to get at the ethmoid labyrinth or open into the frontal sinus. Once, however, the method of preserving the middle turbinate has been properly demonstrated it never fails to convince one that the middle turbinate can be preserved in its entirety and the ethmoid

labyrinth eradicated and the floor of the frontal sinus resected under direct vision.

It is at times necessary (in cases of narrow nasal fossae), to resect the nasal septum in order to make room for the middle turbinate which is pushed or fractured toward the septum during this operation. A resection of the septum furthermore gives it a flexibility which makes the operative field better accessible to postoperative treatment.

The value of retaining the middle turbinate lies in that it serves as a very valuable guide and landmark in limiting the operative procedure below the lamina cribrosa and also to continue its function postoperative. Furthermore, the removal of a part or the whole of the middle turbinate causes encroachment on the olfactory area and therefore opens up direct avenues of infection to the meninges. It is claimed that there exists direct communications between the perineural spaces of the olfactory filaments and the meninges; infectious material from the nasal fossae may travel along these perineural spaces of the olfactory filaments and reach the meninges.

It is the opinion of the writer that most intracranial complications following ethmoidectomy are due either to injury to the cribriform plate or fracture of the floor of the anterior cranial fossae. In the first instance injury to the cribriform plate is always made possible by the removal of the middle turbinate. With the latter intact it is practically impossible to injure the cribriform plate or the olfactory nerve filaments. In the second instance there is always the possibility when removing the middle turbinate, of fracturing the floor of the anterior cranial fossa, due to the very close relation of the bony framework or lamina of the middle turbinate with the floor of the anterior cranial fossa, the latter is marked by a longitudinal ridge running along each side of and parallel to the cribriform plate.

It is very interesting to note from a recent paper by Dr. Prat (Archives Otolaryngology, Vol. I, p. 46) that out of eighty deaths from meningitis following operation on the ethmoid labyrinth, in two cases only was the middle turbinate not disturbed. These figures speak for themselves.

In the following paragraphs is given briefly an outline of the technique of the intranasal ethmoid and frontal sinus operation, with accompanying illustrations of the various steps in the operative technique.

TECHNIQUE.

a. The mucosa lining the entire nasal cavity is thoroughly anesthetized by rubbing it with a 10 per cent cocain solution adrenalized, and then injected with 0.5 per cent novocain solution. The latter is

also injected into the ethmoid cells and when doing a frontal sinus, the region of the supraorbital nerve is also injected.

b. By means of a long blunt instrument or a long Killian speculum the middie turbinate is pushed out of the way and tightly against the nasal septum. A very good view may then be obtained of the middle meatus. With the middle turbinate intact, injury to the cribriform plate or perforation into the anterior fossa of the cranium is practically impossible.

c. With a good view of the ethmoidal region and every manipulation under direct control of vision, two incisions are made into the ethmoidal cells (Fig. 1, a, b). One incision right beneath and horizontal to the middle turbinate, the other incision about one-fourth of an inch below and horizontal to the first. The latter passing through the uncinate process.

d. The ethmoid cells are opened into with a sharp punch forceps, and the cells included between the two incisions made into the ethmoid labyrinth, removed (Fig. 2, a). A small sharp curette is now used to clear away the debris and open other ethmoid cells now accessible. Continuing posteriorly the sphenoid sinus may be easily entered and explored.

e. In order to expose the uppermost, anterior and preturbinal area of the ethmoid labyrinth, a mucoperiosteal flap is made in the following manner (Fig. 1, c, d, e). Three incisions are made to complete this flap. *1.* From the head of the middle turbinate running upward to the roof of the nose or internal border of the nasal bone. *2.* From the upper border of incision one, running, along the outer wall of the nose and as near the roof of the nose as possible, and as far as the apertura pyriformis. *3.* Begins from the end of incision two and carried along the pyriform border to the level of the head of the inferior turbinate.

f. The flap is elevated from the bone beginning anteriorly at the pyriform border and reflected downward upon the inferior turbinate (Fig. 2, b). A very satisfactory view is so obtained of the upper and outer bony nasal wall, very frequently the seat of diseased anterior ethmoidal cells. With a small sharp curette these cells are completely exenterated.

It is at times necessary in order to reach all anterior and preturbinal cells to chisel away the agger nasi. But this step is not always necessary. In fact it is the belief of the writer that the same result can be obtained with the curved curette as with the chisel, except when it is necessary to open into the frontal sinus.

g. In order to get to the frontal sinus it is necessary to reduce the agger nasi with a chisel. When the latter has been properly reduced

the openings into the frontal sinus can be clearly seen and probed into.

h. The next step is to enlarge this opening into the frontal sinus by removing the floor, working from posterior, anteriorly; this can be done either with curettes or the Hallé pear-shaped electric burr (Fig. 3, b).

It is advisable to begin with the smallest size burr and gradually change to larger sizes. As every step is done under direct control of

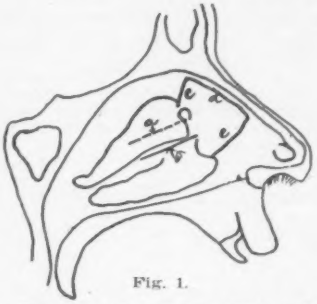


Fig. 1.

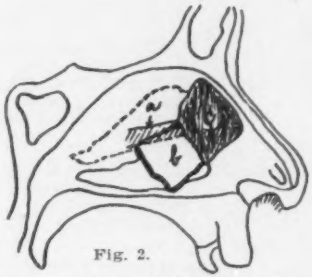


Fig. 2.

Fig. 1. a, b, c, d, e, lines of incision for ethmoid and frontal sinus operations.

Fig 2. a, opening into ethmoid for drainage. b, mucoperiosteal flap. c, denuded bone area made by reflecting flap b.

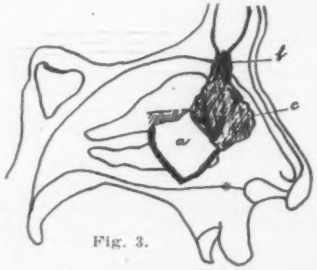


Fig. 3.

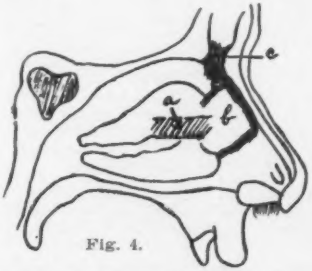


Fig. 4.

Fig. 3. a, mucoperiosteal flap reflected back over inf. turbinate. b, opening made into frontal sinus by resecting part of floor and reduction of agger nasi. c, denuded area of bone made by elevation of flap a.

Fig. 4. a, opening into ethmoid flap for drainage. b, flap replaced. c, opening into frontal sinus made by removal of agger nasi and floor of frontal sinus.

vision, there is very little danger in this procedure. The use of the electric burr is not at all essential in obtaining a good result, as a very good opening into the frontal sinus can be obtained by the proper use of curved frontal sinus curettes.

CHART 1. GROUP 1.

No.	Name	Sex	Age	History	Clinical findings	X-Ray sinuses
1.	L. B.	M.	19	Profuse left nasal discharge. Post nasal drip. Deafness left ear 2 years and 2 nasal operations.	Septum and left middle turb. resected by operation. Pus from region of left ethmoid. Polypi in region of middle turb. on left.	Antra slightly cloudy. Marked clouding of left ethmoid. Frontal sphenoid negative.
2.	R. J.	M.	21	Nasal obstruction. Left nasal discharge for long time. Left temporal headaches.	Left deflected nasal septum. Pus in both nares, mostly from left ethmoid region. Ears and throat negative.	Marked clouding of left ethmoid. Both antra cloudy (thickened membrane.) Sphenoid and frontal negative.
3.	H. P.	M.	33	Profuse left nasal discharge for several yrs. Pain in left side of face.	Left naris filled with pus apparently coming from antra and ethmoids.	Marked clouding of left ethmoid and antrum.
4.	H. C.	M.	36	For 5 months profuse nasal discharge watery. Sneezes a good deal. Nasal obstruction.	Hypertrophied inf. turbs. Left polypoid middle. Profuse muco-purulent discharge from both nares.	Cloudy left ethmoid and both antra.
5.	M. K.	F.	20	Nasal obstruction. Severe headaches 2 yrs.	Right deflected septum. Diseased right middle and polypoid ethmoids. Pus from above inferior turb.	Marked clouding of right ethmoid and antrum.
6.	D. K.	M.	27	Nasal obstruction and discharge for several yrs.	Hyp. right inf. turb. Pus in nares mostly in right side.	Right antrum and ethmoid very cloudy.
7.	J. F.	F.	20	Nasal obstruction. Mouth breather. Very frequent colds and profuse nasal discharge. Uses 1 doz. handkerchiefs daily.	Post op. septum. Cauterized inf. turbs. Entire right middle fossa filled with polypi and pus coming from ethmoidal region.	Cloudy right ethmoid. Both antra very cloudy. Wassermann negative.
8.	B. E.	M.	19	Nasal obstruction. Colds 1 yr. duration. Frontal headaches.	Deflected septum to left. Pus from left ethmoid region.	Both antra and left ethmoid cloudy. Wassermann negative.
9.	D. Z.	F.	21	Nasal obstruction. Constant nasal colds and discharge. Headaches.	Left ethmoid region filled with polypi. Septum deviated to left.	All sinuses cloudy particularly entire left side. Wassermann negative.
10.	D. G.	F.	34	Severe left frontal headaches for long time. Discharge from left ear for for 4 weeks. Nasal discharge.	Nasal pansinusitis. Nose filled with pus and crusts particularly left side. LOMPA. Diseased tonsils.	Shows cloudying of all sinuses particularly right side all involved.
11.	B. I.	F.	28	Marked right nasal obstruction. Constant nasal colds and discharge.	Right naris filled with polypi from region of ethmoid and middle turb. Right deflected septum.	Very cloudy right ethmoid and antrum. Left antrum also cloudy.

CHART 1. GROUP 1.

Previous operations	Operation date	End result
Resection of septum. Left ethmoidectomy.	October 9, 1922. Left intranasal radical ethmoidectomy.	March 24, 1923. Nasal fossae clear. Slight amount of mucopurulent secretions from left ethmoid region. Post nasal drip gone. Feels excellent.
None	October 23, 1922. Left radical ethmoidectomy. Markedly diseased with polypi filling up ethmoid cells.	February 27, 1923. Feels well. Headaches gone. Nasal discharge very slight.
Septum operation 4 years ago. Left antrum punctured and washed recently.	November 30, 1923. Left radical ethmoid and antrum. Intranasal.	July 29, 1924. Nose clear. Feels fine. Gets occasional cold with left nasal discharge. Feels well during intervals.
None	December 28, 1923. Left ethmoidectomy and submucous resection of both inf. turbinates.	July 14, 1924. Feels very good. Nose dry. Breathes very freely.
Submucous resection of septum. Puncture and washing of right antrum.	January 1st, 1922. Right radical ethmoid and right antrum.	July 10, 1922. Feels well. Gets occasional colds in nose. Headaches gone.
Tonsillectomy. Had 4 cauterizations of inf. turbs. Resection of septum.	October 24, 1923. R. ethmoidectomy and submucous resection of ant. head of r. inf. turb.	Last examination February 13, 1925. Feels excellent. Breathes well.
Submucous of septum. Cauterized inf. turbinates.	December 12, 1923. Right radical ethmoid. Puncture of both antra.	March 17, 1924. Feels very well. Still gets nasal discharge but occasionally less than before. Breathes much better than before Result considered not very excellent.
Antrum puncture and washing twice within 2 months. No improvement.	October 17, 1924. Left radical ethmoidectomy with preliminary submucous of septum nasi.	March 18, 1925. Feels very good. Headaches gone. Gets only occasional colds.
None	August 26, 1924. Left radical ethmoidectomy with preliminary submucous resection of septum. Masses of polypi removed from left middle fossa and ethmoid labyrinth.	December 10, 1924. Markedly improved. Still gets nasal discharge but less due to the involvement of both antra.
None	April 25, 1925. Right ethmoid radical. Punctured both antra.	July 13, 1925. Headaches gone. Nasal discharge moderate. Ears are well now. Still under treatment.
None	March 18, 1925. Right ethmoidectomy and removal of polypi from ethmoids and middle turbinate.	April 20, 1925. Feels excellent. Breathes well and has had no colds or nasal discharge since operation.

i. The mucosa lining, the frontal sinus, can now be curetted by using the proper shaped frontal sinus curettes. Care must be taken to prevent injury to the medial and frontal sinus walls.

j. The mucoperiosteal flap is replaced and held in position by iodoform gauze packing. The middle turbinate is restored to its original position (Fig. 4, b).

Postoperative treatment consists in the removal of the gauze packing on the second or third day and the frontal sinus irrigated through a cannula every day or so according to the condition present. Also, in order to keep the opening made into the frontal sinus patent, metal sounds are passed up into the sinus. The sounds prevent the formation of granulations which could otherwise form and occlude the opening made into the frontal sinus.

CASE REPORTS.

The twenty cases reported in this series are divided into two groups: Group I, comprising Cases 1 to 11, are reported in outline form on Chart I. In these cases only the ethmoids and antra were operated on. Group II, comprising Cases 12 to 20, are the cases where the intranasal frontal sinus operation was performed, together with the other sinuses involved.

Group II. Case 12: S. A., male, age 24 years, chauffeur.

History: On Feb. 13, 1925, patient came to my office complaining of severe pain in right forehead of eight months' duration. Had a nasal operation six or seven weeks ago without any relief of pain. Pain is now so intense patient cannot sleep.

Examinations: Right high deflection of septum. Anterior portion of middle turbinate removed by previous operation. Pus coming from underneath middle turbinate apparently from ethmoid and frontal. Left naris clear. Very marked right supraorbital tenderness.

Ears and Throat: Negative.

X-ray showed marked clouding of right ethmoid and frontal sinuses (Fig. a, Case 12). Other sinuses clear.

Diagnosis: Acute suppurative frontal sinusitis, probably an exacerbation of a subacute or chronic frontal sinusitis associated with ethmoiditis.

Treatment: Feb. 17, 1925, patient was admitted to the hospital where I performed an intranasal ethmoid and frontal sinus operation; evacuated thick pus from the right frontal sinus and exenterated the right ethmoids. Ethmoids were filled with polypi. Polypi at floor of frontal sinus removed with frontal sinus curette. Patient experienced relief from frontal headache immediately following evacuation of the pus from the frontal sinus.

Postoperative Treatment and Course: Patient made a quick and uneventful recovery. Treatments consisted of nasal irrigations, argyrol tampons (Dowling), and passing of sounds into frontal sinus. Patient was last seen June 23, and again Dec. 25, 1925. Is feeling fine, no recurrence of headache. (See X-rays taken postoperative. Fig. d, Case 12.)

Case 13: M. G., age 40 years, restaurant proprietor, male. Referred to me by Dr. M. Rubinstein on March 28, 1925.

History: Following an attack of grippe seven months ago, patient developed very severe pain in the left forehead. Pain is constant, worse in morning. Cannot think clearly. Losing strength very rapidly. Was treated at dispensaries for several weeks, but got no relief. Pain is daily growing more severe.

Examination: Rhinoscopic examination revealed a left deviation of septum marked with large ridge. Left middle turbinate rudimentary and appears to have been removed during a previous operation. Left ethmoid region diseased and has polypoid changes. Pus coming from left ethmoids and region of left frontal sinus. Large quantity of pus obtained on suction. Left supraorbital tenderness very marked.

X-ray of sinuses revealed marked clouding of left frontal, ethmoid and antrum. Slight clouding of right antrum (Fig. a, Case 13).

Operation: May 20, 1925, patient was admitted to the hosptial where after a preliminary submucous resection of the na al septum I performed an intranasal left ethmoidectomy and resection of floor of left frontal sinus, which was followed by a free discharge of thick pus from the latter. The ethmoid labyrinth was diseased and filled with granulations and polypi leading into the sphenoidal sinus, which was also entered. Granulations and small polypi were found at floor of left frontal sinus and removed with curette. A No. 3 sound was easily introduced into the opening made into the frontal sinus.

Postoperative Treatment and Result: Patient was discharged from hospital on third day and treated during the ensuing two weeks by hot nasal douches, argyrol tampons (Dowling method) and introduction of sounds into frontal sinus. Ever since the day of the operation patient was free from pain or discomfort in the left frontal sinus region. Nasal discharge gradually diminished. Patient was again X-rayed with sounds inserted into the frontal sinus six and twelve weeks following the operation, showing the result obtained (Fig. b, c, d, Case 13).

Case 14: J. W., age 32 years, clerk, male. Referred to me by Dr. Derow, May 27, 1925.

History: Severe right frontal headache and dizziness in the morning for the past year. Had nose operated on (septum) nine years ago for similar pains in left forehead. Tonsils were removed two years ago. Had no nasal discharge. Gets frequent cold in nose.

Examination: Rhinoscopic Examination: Septum only partly resected. Right high deflection intact. Nares filled with pus. Turbinates intact. No evidences of polypi from any of the sinuses. Right frontal region very tender to touch and percussion. Ears and throat negative.

X-ray of Sinuses: Shows marked involvement of the right frontal ethmoid and antrum. Also left antrum is cloudy, but to less degree (Fig. a, Case 14).

Operation: On June 6, 1925, patient was admitted to the hospital where I performed a combined ethmoid and right frontal sinus operation, intranasally. A very narrow infindibulum was encountered and a No. 2 sound was passed with great difficulty due to the swelling and hyperplastic condition of the mucous membrane lining it. Later on a No. 2 sound passed easily. The ethmoid was found to be sclerotic. The antra were left alone. The operation was made more difficult due to the right high deflection of the nasal septum left in by the previous operator. On entering the frontal sinus a moderate quantity of pus was liberated from the frontal sinus to the great and immediate relief of the patient.

Postoperative Treatment and Result: Patient was sent home on the second day. Treatments consisted of passing of sounds and nasal douches of hot solution, also argyrol tampons. The patient was taught to use the latter at home daily and instructed to leave them in for half an hour.

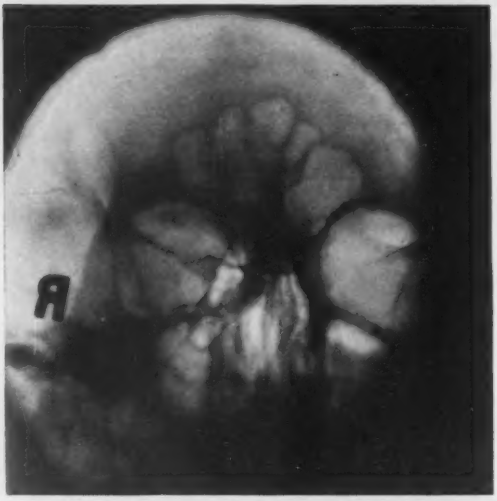
Patient was X-rayed again with sound introduced into frontal sinus six weeks and four months following the operation. The plates are self-explantory (X-ray plates, Case 14).

When last seen, Jan. 26, 1926, patient felt excellent. Has not had any frontal headache or pains since the operation. Patient has since developed a left acute purulent otitis media with mastoiditis, from which he recovered completely without any mastoid operation.

Case 15: H. K., male, age 36 years, traveling salesman. Referred to me by Dr. S. Z. Freedman, June 5, 1925.

History: Constant nasal colds, headaches and pain in left frontal region above eye. Was operated on nose for relief of pain but latter did not subside.

Examination: Rhinoscopic Examination: Septum high deflection to left. Left middle turbinate partly absent with polypoid changes in

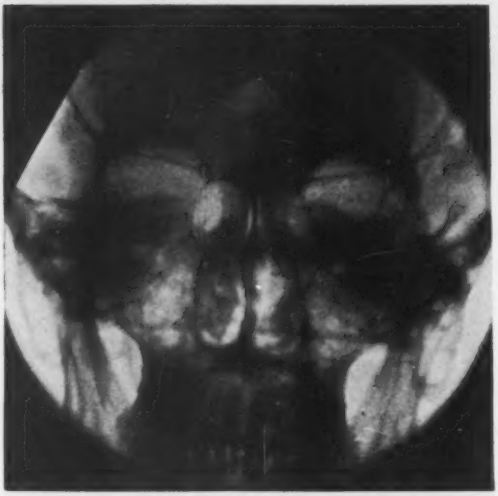


Case 12. (a) X-ray before operation. Showing involvement of the right frontal sinus.

Case 12. (b) Anterior posterior view, showing sound in right frontal sinus.

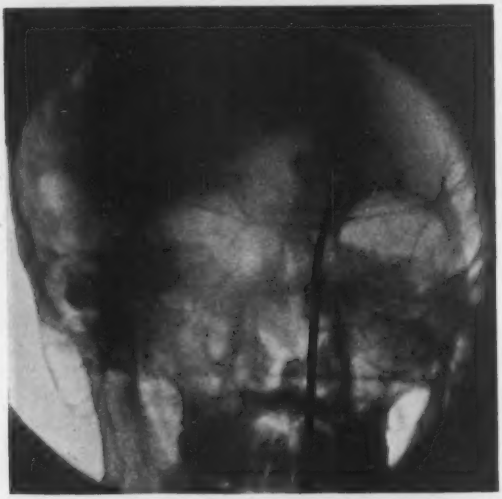
Case 12. (c) Lateral view showing sound in frontal sinus.

Case 12. (d) X-ray taken about three months post-operative, showing frontal sinus all cleared up.



Case 13. (a) X-ray plate before operation, showing involvement of the left frontal sinus.

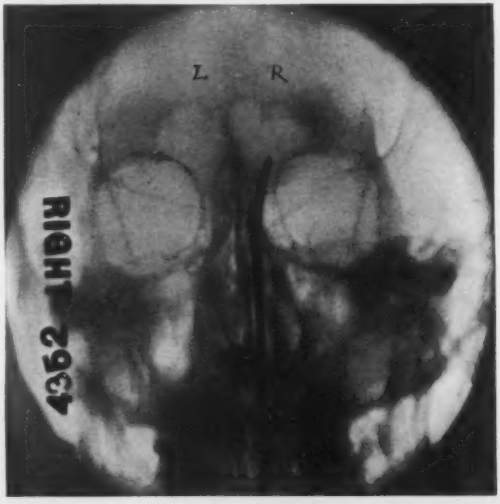
Case 13. (b) Lateral view showing sound in left frontal sinus.



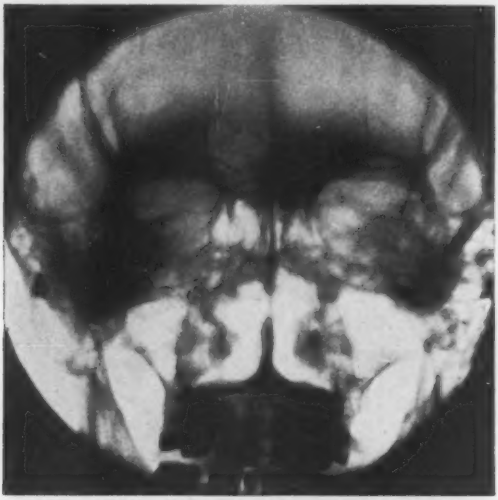
Case 13. (c) X-ray showing view of sinuses taken anteroposterior, with sound inserted into left frontal sinus. X-ray was taken six weeks post-operative.

Case 13. (d) Anterior view taken three months post-operative, showing evidences of resolution of the diseased process in the lining membrane of the sinus operated.

Case 14. (a) X-ray plate showing involvement of both frontal sinuses, particularly the right.

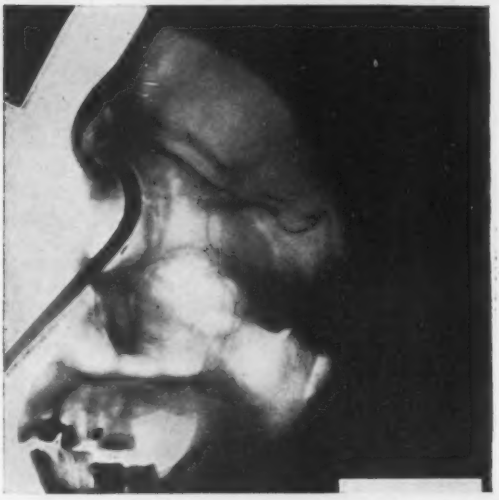


Case 14. (b) Same case, X-ray post-operative, with sound in the right frontal sinus.



Case 15. (a) X-ray showing involvement of left frontal and ethmoid sinuses.

Case 15. (b) Anterior view taken with sound in left frontal sinus.



Case 15. (c) No. 4 frontal sinus sound inserted into left frontal sinus. X-rayed about six weeks post-operative.

Case 16. (a) X-ray plate before operation, showing involvement of the right frontal sinus, ethmoid and both antra.

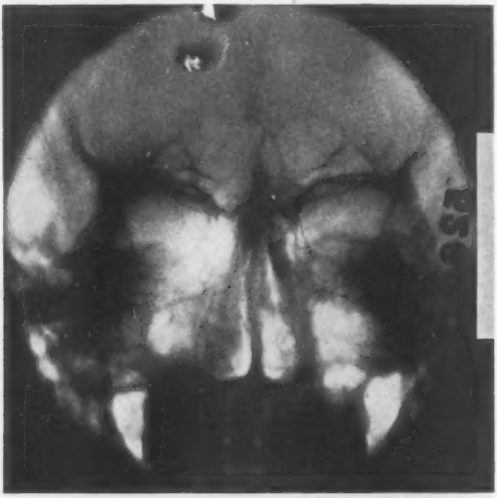
Case 16. (b) X-ray plate after operation, showing sound in right frontal sinus.

Case 16. (d) Showing irrigating cannula in right frontal sinus.

Case 17. (a) X-ray plate before operation, showing involvement of the left frontal sinus, ethmoid and antrum.

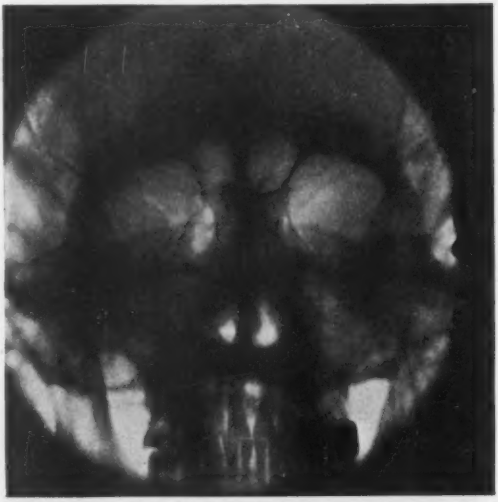
Case 17. (b) X-ray plate, post-operative, showing sound in the left frontal sinus.

Case 17. (c) Lateral view of same case.



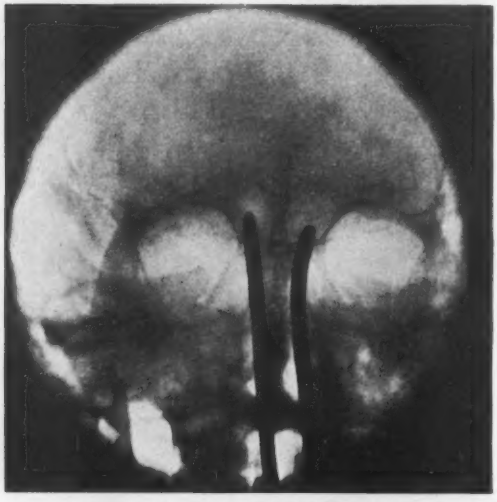
Case 18. (a) X-ray before operation, showing involvement of inner portion and floor of left frontal sinus and left ethmoid.

Case 18. (c) X-ray plate taken post-operative, showing a fairly clear left frontal and ethmoid.



Case 19. (a) X-ray plate before operation, showing involvement of all the sinuses and nares filled with polypi.

Case 19. (b) X-ray with sounds in the frontal sinuses.



Case 19. (c) Same as (b), lateral view.

Case 20. (a) X-ray plate, post-operative, with sounds passing into frontal sinuses through floor.

Case 20. (b) Lateral view of same patient.

remaining portion as well as polypi from left ethmoid region. Pus coming from left ethmoid and frontal region. Right naris fairly clear and normal. Ears and throat negative.

X-ray of Sinuses: Revealed a marked clouding of the left frontal, ethmoid, antrum, also right antrum considerably veiled (Fig. a, Case 15).

Wassermann: Negative.

Operation: On June 10, 1925, patient was admitted to the hospital where I did a combined intranasal ethmoid and frontal sinus operation. The ethmoid was found filled with polypi and pus leading into the left sphenoidal sinus which was opened into, and found full of diseased membrane and polypi. The floor of the frontal sinus was removed by sharp curettes and free pus evacuated from it. A No. 3 sound passed up easily. A preliminary submucous of nasal septum was performed to allow more space to operative field.

Postoperative: Patient was discharged from hospital on third day and treated subsequently with argyrol tampons, nasal douches and sounds. Patient was X-rayed again six and ten weeks postoperative with sound inserted into frontal sinus (Fig. b, c, d, Case 15).

Result: Patient was last seen on July 13, 1925. Has had no pain or any discomfort ever since the operation. There is still present a slight amount of nasal discharge on left side. No pus can be seen coming from left frontal or ethmoidal sinus. A No. 3 sound passes up easily. Patient says he never felt better in his life.

Case 16: S. C., age 28 years, male. Referred to me by Dr. L. Cohen, Nov. 7, 1925.

History: Subject to nasal discharge and colds for years. Right side of nose is blocked completely and has pus discharge. For past few months has had severe pain in the right eye and entire right side of head.

Rhinoscopic Examination: Right naris completely filled with polypi, protruding through anterior naris and covering entire floor of right nasal fossa. Left side small polypi from ethmoid region. Pus in both nares. Marked tenderness over right supraorbital region and root of nose.

Ears: Double O. M. C. C. *Throat:* Postnasal drip of pus.

X-ray of Sinuses: Entire right side cloudy as well as left ethmoid and antrum. Left frontal is fairly well illuminated.

Treatment and Operation: Admitted to hospital Nov. 14, 1925. Enormous polypi removed from right naris, apparently coming from ethmoids, antrum and sphenoid. Due to very roomy right naris a submucous resection of septum was unnecessary. All the right sinuses were cleaned out; a good portion of nasoantral wall resected;

the anterior wall of the sphenoid was resected and frontal sinus opened very wide so that a No. 4 sound was passed. Thick pus evacuated from frontal sinus and interior curetted with frontal sinus curette.

Postoperative Treatment and Course: Immediately following operation all pains in head and eye ceased. Treatments are still continued and consist of irrigations of sinuses and argyrol tampons. Discharge is very moderate and patient feels very well and can work (Fig. Case 16). The result obtained is very good. There is no evidence of any new polypi forming. The frontal sinus is sounded and kept open for drainage. Patient is still under observation and treatment. From the appearances it is expected that the same operation will have to be performed on the left group of sinuses.

Case 17: J. L., age 30 years, male. Referred to me by Dr. Wm. Stander, Nov. 13, 1925.

History: Left nasal discharge for long time, and very profuse during the past six months. Left hemicranial headache.

Rhinoscopic Examination: Very large perforation of septum involving almost the entire cartilaginous portion. No history of previous operation. Left high deflection of septum. Numerous polypi from left ethmoid region and profuse, thick, purulent discharge coming from region of all sinuses of left side. Right naris clear.

Ears: Negative. *Throat and Larynx:* Negative.

X-ray of Sinuses: Marked clouding of all sinuses of left side. Right side clear.

Wassermann: Negative.

Diagnosis: Chronic left suppurative pansinusitis.

Treatment: Nov. 21, 1925, I did a preliminary submucous resection of nasal septum in order to make room for operation and drainage of left sinuses. On Nov. 30, 1925, I admitted patient to the hospital and performed an intranasal ethmoid and frontal sinus operation. Ethmoid was found filled with polypi extending posteriorly into sphenoid, which was also cleaned out. Large opening was made into frontal sinus and polypi removed from about the opening and thick pus evacuated. A No. 3 sound was passed through opening into frontal sinus.

Postoperative Treatment and Course: Patient got immediate relief from headache. Improved in general health and has returned to his occupation. March, 1926, patient is still under treatment. Discharge of pus from the sinuses is very slight. Has only occasional slight headache. Treatments are still given and consist of irrigations

of sinuses and argyrol tampons given at the office and by patient at home.

Case 18: H. W., age 23 years, male, dress cutter. Came to me May 18, 1926.

History: During the past year has been subject to very many colds in nose, profuse left nasal discharge, accompanied by marked sticking pain in the left forehead towards median line and root of nose.

Rhinoscopic Examination: High left deflection of septum pushing an enlarged middle turbinate up against outer nasal wall. Inferior turbinates hypertrophied. Left naris filled with pus coming from region of left ethmoid and frontal sinuses. Marked left supraorbital tenderness.

Throat and Ears: Negative.

X-ray Examination of Sinuses: An area of marked clouding in left inner portion of frontal sinus (see X-ray *a*, Case 18). Left ethmoid very cloudy. Left antrum apparently filled with exudate and granulations. Left antrum moderately cloudy.

Operation: On May 27, 1926, patient was admitted to the hospital and operated. The following was done: *1.* Preliminary submucous of nasal septum. *2.* Left ethmoidectomy with resection of floor of left frontal sinus. *3.* Puncture of antra and resection of large opening in both nasoantral walls.

Findings: Left polypoid ethmoiditis and polypi at floor of left frontal sinus. Right antrum was found to contain pus and mucosa studded with small and large polypi. Left antrum had diffuse polypoid degeneration of the mucosa.

Postoperative Treatment and Course: Packing was removed on third day and patient discharged from hospital. No postoperative reaction whatsoever. Headache and pain over left frontal sinus has disappeared and has not recurred since the operation. The sinuses are irrigated several times a week; the frontal sinus is sounded to keep it patent until complete healing takes place. Argyrol tampons are used occasionally. X-ray plates taken postoperative, June 8, with sound in the frontal sinus, show a marked diminution in the clouding of the frontal sinus condition as well as the other sinuses. Patient is still under treatment and observation.

Case 19: H. W., age 35 years, male, laundry worker. Came to me April 28, 1926.

History: Nasal obstruction; changes from side to side. Constant nasal colds, profuse nasal discharge and sore throat. Severe frontal headaches for long time.

Rhinoscopic Examination: Both nares filled with polypi coming apparently from all the sinuses. Inferior turbinates very much atrophied. Atrophic rhinitis. Tenderness over both frontal sinuses Nares filled with pus.

Throat: Atrophic pharyngitis and postnasal discharge of thick, greenish pus.

Ears: Double O. M. C. C., with marked retraction.

X-ray of Sinuses: Marked clouding of all the sinuses.

Operation: On May 4, 1926, I operated on the right side; removing all the polypi first, followed by a radical intranasal ethmoidectomy, resection of floor of frontal sinus, anterior wall of sphenoid and large opening resected in right nasoantral wall. All the sinuses were filled to capacity with polypi, particularly the ethmoid and sphenoid. A No. 4 sound was passed with great ease into the right frontal sinus.

On June 11, 1926, the same operation was performed on the left side, with same findings and results.

Postoperative Treatment and Course: There was quite a good deal of postoperative reaction which manifested itself mainly in severe pain in the forehead and face, lasting for over a week and followed both stages of the operation. The pain gradually subsided and finally disappeared entirely, leaving the patient in a most comfortable condition. There was no temperature, or marked bleeding. Treatments consisted of cleansing nares and sinus with a blend solution, and passing of No. 4 sounds into frontal sinuses. Nasal discharge ceased very soon postoperative. Patient was X-rayed again June 18, 1926 (see X-ray, Case 19). Treatments are being continued about twice a week, and patient is still under observation. The result so far is considered very satisfactory. All the previous symptoms and complaints having completely subsided. Last examination was made Oct. 15, 1926.

Case 20: M. L., female, age 40 years, house worker. Came to me May 10, 1922.

History: Severe right-sided frontal headaches. Nasal obstruction, and colds during the winter. Headaches for nine years. I advised her a nasal operation, but patient did not return until April 26, 1926. She had since been operated on at a hospital clinic (about three years ago), but has felt worse since the operation. Headaches are very severe and now in both sides of forehead. Has a constant nasal discharge. Breathing is, however, better since the last operation.

Rhinoscopic Examination: Bilateral polypoid ethmoiditis and infected antra. Pus coming from region of frontals, ethmoids and antra.

X-ray of Sinuses: Taken at a hospital clinic showed a marked veiling of all the sinuses, particularly ethmoids and antra, more involvement of left side.

Operation: On May 24, 1926, a bilateral ethmoidectomy and frontal sinus operation was performed at the Midtown Hospital and large openings resected in the nasoantral walls of both antra. Both ethmoids were found diseased and filled with polypi. On resecting floor of frontal sinuses a No. 3 and No. 4 sound were passed up with great ease and polypi about openings made were removed with punch forceps.

Postoperative Treatment and Course: Patient was discharged on the third day, having had no postoperative reaction. Bleeding was very moderate. Treatments were given daily for two weeks and consisted of suction, irrigation of sinuses and argyrol tampons. Patient was again X-rayed (see X-ray, Case 20) with frontal sinus sounds in situ which show the character, location and degree of openings made into the frontal sinuses for drainage and ventilation. The sounds are introduced into the frontal sinuses at every treatment. Patient's general condition has improved considerably. She has gained in weight and strength. Has only had an occasional slight headache and the greater part of the time since the operation has been completely free from headaches, as she had never been since the past nine years. The patient is still under treatment and observation. Last examination, Oct. 9, 1926.

Comment: After a careful examination of these patients, their histories and condition (clinical) before and after the operation, one cannot but feel that of all the operations we have at the present time, both for ethmoid and frontal, the operation herein described is the operation of choice. The writer feels convinced that by resorting to a preliminary intranasal frontal and ethmoid before doing or advising an external operation, the latter will rarely have to be resorted to. A radical external frontal is indicated only when a preliminary intranasal operation has failed to relieve the condition. Only in rare instances of markedly advanced disease will it become necessary to do an external operation. The position of the frontal and ethmoidal sinuses and the manner of drainage afforded them, both by nature and this operation, will almost always yield results. When one considers the long drawn out course of the post-operative treatment of the external frontal sinus operation, the suffering, frequent disfigure-

ment, loss of time and expense to the patient, the intranasal ethmoid and frontal sinus operation will always be given the preference to any other method of procedure. A further report of the above series of cases will follow after a longer period of time has elapsed post-operative, and still further observations have been made of the results obtained.

Conclusion: The intranasal ethmoid and frontal sinus operations as here described are the operations of choice as compared with the other operations in vogue at the present time for the following reasons.

a. It preserves the middle turbinate bone and leaves the nasal mucosa in as normal a state as may be possible, whereas the middle turbinate is sacrificed in part or whole, and a good deal of the surrounding normal nasal mucosa destroyed in the other methods used.

b. Injury to the cribriform plate, anterior cranial fossa and olfactory nerve filaments is practically made impossible.

c. By constructing the mucoperiosteal flap and preserving the middle turbinate, post-operative scarring, dryness and crust formation, as well as the long drawn out course of post-operative treatment is avoided.

d. It is at times difficult to tell post-operatively whether or not an operation has been performed, so little damage is done to the nasal structures.

e. It opens up a route for entering the frontal sinus, giving it sufficient drainage without risking post-operative complication frequently the result of intranasal sinus surgery.

f. The intranasal frontal sinus operations should always be done first, before the external operation is attempted, as the majority of cases will get well without any further operative procedure.

I wish to express my indebtedness to Dr. Louis J. Friedman and Dr. S. Lubin for their co-operation and X-ray work, which helped considerably in the preparation of this paper.

211 Henry Street.

A SELF-RETAINING ANTRUM CATHETER FOR DRAINAGE AND IRRIGATION OF THE MAXILLARY SINUS.*

DR. M. JOSEPH MANDELBAUM, New York City.

In the entire domain of rhinology, there is perhaps no more difficult nor common problem than that of the treatment of sinus infections in infants and young children. There also seems to be an increasing incidence of this class of cases in the young, unless their increased recognition, due to improved methods of diagnosis or a fuller appreciation of their importance, discloses a greater frequency than heretofore recognized.

While most fortunately a very high percentage of these cases become cured (?) spontaneously, thousands of subacute and chronic types of puerile sinusitis cases continue indefinitely, unrecognized or uncured until numerous and divers manifestations of involvement of the respiratory, gastrointestinal, urinary or other systems evidence themselves. The local infections have gone out of bounds and in the careful systematic search for the etiological causes, the original source and perpetuating factors of many of these derangements are found in the paranasal sinuses.

The mere finding of these primary focal infections however does not always spell a cure. Indeed the resistance to cure and the difficulty of treating and handling these physician-fearing youngsters ofttimes makes their proper treatment a serious problem.

Dean and Shea have perhaps more than any other American specialists in this field shown the way to a successful routine for the management of these patients. The puncture of the infected infantile antrum, taking of bacterial cultures, and insertion of a temporary rubber catheter drainage tube permitting successive irrigations with the least pain and disturbance to the individual was a far step forward in this class of cases. They and perhaps a few others are favored by their good fortune in being able to hospitalize their cases. Unfortunately, however, many of us have insufficient hospital accommodations for these patients. Not alone many physicians, but many mothers and baby nurses will testify to the at times despairing attempts to irrigate the antra of such children in the office or in the home. Almost invariably the struggles of the office or home-treated

*Read with motion picture demonstration before the meeting of the Harlem Medical Association, Jan. 5, 1927.

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child will result in the sudden pulling out of the straight rubber draining tubing from the nasal antrum. After considerable experience with this class of cases, both at home and in the office, I felt that a self-retaining type of antral drainage catheter would greatly lessen the problem of non-hospital treatment.

The idea, however, of tubular drainage of the maxillary antrum is not new. Many years ago there were devised hard rubber as well as metal drainage tubes for this purpose. Most of these were irritating because of their hardness and the method never became popular. More recently Shea, with the use of an ordinary soft rubber drainage

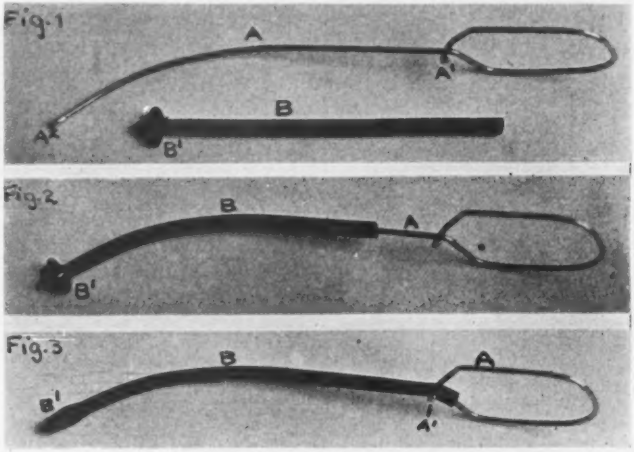

Fig. 1. (A) metal introducing stylet with spring-lock (A^1) and bulbous tip (A^2). (B) rubber retention catheter for drainage of antrum with two-winged tip (B^1).
Fig. 2. Catheter (B) placed over introducing stylet (A) in unstretched (unlocked) position.
Fig. 3. Catheter (B) in stretched position on introducing stylet, locked at spring-lock (A^1). Note winged tip (B^1) straightened out by stretching.

tube of small calibre ,revised and improved this easy method of draining and irrigating the maxillary sinus, particularly in children. I have had very pleasing results with this method, both in children and adults, using it almost invariably in properly selected infantile cases and occasionally in adult cases not responding promptly to the usual methods of treatment.

An important advantage of the soft rubber drainage tube is that it is non-irritating and in a large number of cases patients have worn the tube from two to eight weeks without the slightest inflammatory reaction to the nasal mucosa. I have found it advantageous as a

matter of routine to remove the tube about once every seven to ten days for cleansing and sterilization. Another distinct advantage, particularly in infants and children, no preliminary cocainization is required as irrigation via the retention catheter method is practically painless.

Description of Tube: I devised one of this type and through the kind co-operation of C. R. Bard, Inc., a most satisfactory soft rubber antrum catheter has been produced by Eynard, of Paris.

It is in fact a miniature Eynard self-retaining urinary catheter of a size specially made to meet the particular needs of antral drainage.

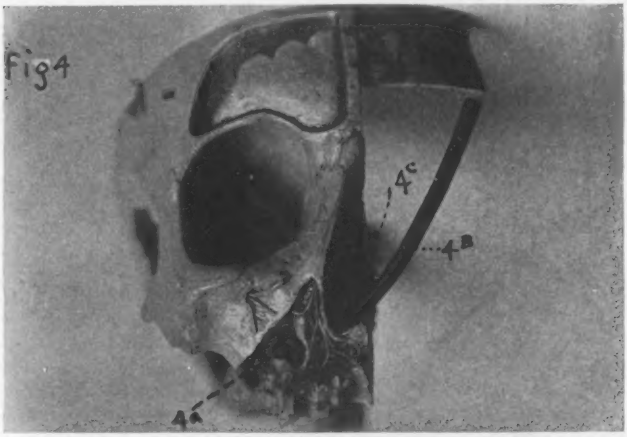

Fig. 4. Catheter (4b) introduced into right antrum (4a) beneath right inferior turbinate (4c). (Front wall of antrum has been removed to show winged end of catheter "in situ".)

It is made of soft rubber, 8 c.m. long and 12 Fr. diameter. The antral end has two wings, whose fenestra permit the largest size drainage openings consistent with strength and small dimensions.

A specially-made introducing stylet was made to fit the antrum catheter, correctly curved to readily introduce it via the nasal vestibule beneath the inferior turbinate.

When inserted into the catheter, the latter conforms to the shape of stylet.

Technic: After proper preparation and cocainization, an opening is made beneath the inferior turbinate, in the usual location, into the antrum. I have found the Coakley antrum trocar best suited in size and curve for puncturing the antral wall. After the puncture is

made, when desirable, a smear and culture is taken. The sterilized antrum catheter is placed over the introducing stylet, and lightly stretched over its rounded end, and the proximal end "locked" beneath the spring-wire clasp near the handle of the steel-wire introducer.

This stretches and straightens out the two "wings" and permits the easier introduction of the catheter through the puncture hole into the antrum. The end of the catheter is lubricated with sterile olive oil (mineral oil causes deterioration of rubber), and it is inserted beneath the inferior turbinate through the previously made puncture into the antrum. The clasp is then unlocked and the stretched catheter assumes its natural size. Before withdrawing the wire stylet, the fingers of one hand grasp the rubber catheter just as it emerges from

Fig. 5. Proximal end of catheter (5a) turned back into right side and out of sight between treatments.

the nose, while the handle of the unlocked introducing stylet is held with fingers of the other hand, "fixing" the position of the catheter at the nose with the fingers of one hand and with a sort of sliding motion, as if endeavoring to slip the catheter off the stylet further into the antral cavity, the stylet is withdrawn from the catheter, leaving the latter in place in the antrum. The proximal end of the catheter is then "lightly" grasped by two fingers and "gently" pulled out a very short distance until one feels the resistance of the "winged" end of the catheter against the inner wall of the antrum.

If one pulls too hard, the catheter will snap out and necessitate reintroduction. With a little practice it becomes a very simple pro-

cedure. The proximal end of the catheter now will be found projecting about 3 c.m. to 4 c.m. beyond the nasal opening. Then with a Harris "adaptor" or other snugly fitting connecting piece, the syringe or other irrigating apparatus is connected with the proximal end of catheter and lavage of antrum proceeds in the usual manner. We find a 20 c.c. syringe best adapted for this purpose, as with it one can better regulate amount of force needed to inject fluid into the antral cavity. After antrum is washed out satisfactorily (irrigating fluid returning clear), the residual fluid in antrum may be removed by gently forcing a syringeful of air through the catheter.

It is our custom after emptying the antrum to inject 2½ c.c.m. of 1-250 solution of acriviolet into the antrum with a small 5 c.c.m. syringe inserted into the distal opening of catheter. The patient's head is bent backwards, and with the 5 c.c.m. syringe *"half-filled"* with acriviolet solution, and piston withdrawn to the 5 c.c.m. mark, if held vertically while injecting the 2½ c.c.m. of air in the upper part of barrel of syringe will force every drop of the solution out of the catheter into the antrum. The proximal end of the catheter is then "folded back upon itself" into the nasal chamber on the same side. This prevents leakage of the medications or antral discharge externally. It keeps the catheter hidden, but always easily accessible for the irrigations by the physicians or attendant or the patient himself, if old enough to be instructed in its use.

After the proximal end of tube has been folded back into the nasal chamber a small sterile plug of cotton is introduced into the nasal vestibule and changed as often as necessary. Between treatments the patient is made more comfortable by injecting about a half medicine dropper full of 2 per cent solution of camphormenthol in albolene into each nostril two or three times daily.

In a number of cases of bilateral antral sinusitis, patients have comfortably worn a retention tube in both antra without any great discomfort.

I can recommend this procedure as a safe and rapid method of antral irrigation and it is infinitely less painful to the patient, thereby avoiding that unfortunate fear of treatments which occasionally occurs in nervous individuals, and eliminating the necessity of repeated cocainization preliminary to treatments.

125 West 72nd Street.

PHYSIOLOGICAL FACTORS IN THE CONTROL OF OTITIC MENINGITIS.*

DR. WELLS P. EAGLETON, Newark, N. J.

Tonight I wish to refer to certain observations made during the treatment of and operations on a considerable number of cases of meningitis. These have given rise to some speculation on my part in an effort to more fully understand meningitis. The method I have employed has been to study the history of my cases, make notes thereon, and then later I have re-examined all of the material; dividing those cases that have recovered from those that have died and been submitted to post-mortems, to see if I could discover anything new. I hope some time to compile all this material, for it is surprising how many new viewpoints one obtains by examining consecutively a large number of one's own cases.

It is to emphasize certain of these viewpoints (some of which may be right or may be wrong) that I am addressing you tonight.

First, I have come to the conclusion that suppurative meningitis is cured spontaneously very much more frequently than we realize: that it is curable as long as it is localized. I say this because I have seen three cases at post-mortem that undoubtedly had been cured of meningitis but died of something else.

Case 1: A patient had a latent cavernous sinus thrombophlebitis. She had been sick for six weeks and was thought to have pneumonia. During the entire six weeks she had a great deal of pain in her head. Suddenly she became profoundly ill, exophthalmos developed; she went into a deep coma, and soon died. (Notice that the pain in her head had been present for six weeks.) The post-mortem disclosed an old exudate in the basal cisterna, which, however, had been cured. She did not die of meningitis.

Case 2: A man undoubtedly had meningitis. We opened the dura and let out a quantity of cerebrospinal fluid; he, however, continued to have a high temperature and ultimately died of sepsis. The post-mortem showed an unrecognized thrombophlebitis of the opposite side, the cause of the continued sepsis, but the meningitis had been cured.

Accordingly, I have come to the conclusion that localized septic meningitis is curable. It is cured by nature's process.

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*Read before the New York Academy of Medicine, Section on Otology, April 9, 1926.
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What is nature's process? for that is the crux of the whole problem of the surgical treatment of meningitis. Undoubtedly, the curative process must occur inside the subarachnoid space itself. The pathological picture of *early* localized meningitis, *viz.*, excessive cerebral fluid containing micro-organisms with a slight amount of exudate—seen at autopsy at the moment of the removal of the brain from the dura—does not last long. It soon disappears because the pia-arachnoid is a very delicate membrane, but if we take such a case —of early meningitis—and study it microscopically, we may find a suggestion of how to treat it surgically.

The subarachnoid cells are similar to those in the peritoneum. Being a very low type of cell they proliferate very readily. By this proliferation they form adhesions which wall off the area of inflammation. It is by availing ourselves of this walling-off process that we can hope to stop the infection while the meningitis is still limited.

Again, if we are going to make any progress in the treatment of meningitis, we must get rid of the idea that by any one surgical process the condition usually seen at post-mortem—general septic leptomeningitis—can be cured. It is a mechanical impossibility. When a septic inflammation involves all the meninges and extends from the vertex to the lumbar region—when the fluid at lumbar puncture contains a large number of organisms—no method known today can eradicate the septic condition. Some of us had the privilege of hearing Dr. Kolmer's very brilliant paper on the cure of experimentally produced pneumococcic meningitis by through and through drainage. He described how he produced a meningitis by the injection of pneumococci into the basal cisterna of the dog by way of an occipitoatloid puncture. And he found that if at any time during the first forty-eight hours he washed through the ventricles (after drilling a hole in the frontal region and pulling a cannula in the occipitoatloid region), he could cure the case. No other method he has tried—no injection of antiseptics—has had any influence. He says that normal salt solution (with a little calcium in it) is effective. However, there is a weakness in the application of this method to meningitis in the human. As I understand it, Kolmer puts micro-organisms directly into the central portion of the cerebrospinal fluid system, that is, into the fourth ventricle, and within forty-eight hours washes through from the lateral ventricle to the occipitoatloid region. But meningitis in the human does not originate in the ventricles as in his experimental work. In otitic meningitis, in the human, the ventricles are not affected until late—meningitis of the ventricles is a terminal process. When they are

affected all the leptomeninges of the brain and cord are involved; and so I doubt very much whether the system of through and through ventricular irrigation promises much for the future *in general leptomeningitis*, although I have employed subarachnoid cortical irrigation in probably twenty cases with a few recoveries.

What then can we do? First of all, I wish to emphasize that if we hope to cure meningitis in a considerable proportion of cases, we must make a diagnosis of meningitis while the process is still limited. Consequently, we must try to evolve means whereby we can decide the location of the septic fluid while it is still confined to certain spaces. If we diagnose meningitis and its location early enough, we ought to cure a certain proportion of cases.

During the last few months I have had four patients with symptoms of leptomeningitis and local collections of infected fluid who have gotten well. I am sure that the proportion will progressively

Case 3.

increase as we pay more attention to early diagnosis; not only as to the disease itself but as to its localization.

Let us consider meningitis from nasal suppuration.

Case 3: A patient had had an external frontal sinus operation. The wound had nearly healed, and he was thought to be recovering but continued to have irregular pain in his head. One day, after a disturbed night because of the pain, his temperature rose to 101° F. Several X-ray pictures had been taken, the last of which disclosed an involvement of a small area in the frontal bone at some distance from the frontal sinus. He was told that the condition would kill him unless it could be stopped by a radical and disfiguring operation. The frontal sinus was in a healthy condition at operation; but after removing bone that looked normal, we suddenly came into an orbital prolongation of the sinus, and on exposing it freely we reached an

area of dura with three small openings and evacuated a large amount of infected cerebrospinal fluid. Some days following the operation, as the man still had headache, we did a lumbar puncture, which immediately relieved the pain.

What does all this mean? It means that for a long time he had a process going on under the dura—a localized area of infection—which we were lucky enough to find because of the extensive bony removal. When we let out the infected fluid, the process stopped. But why the continuation of the pain? And why was he relieved immediately after the puncture? I think because he still had an excess of protective fluid in his meninges, which we evacuated by lumbar puncture. We know that a headache resulting from the drawing off of cerebrospinal fluid must be due to something—probably from an upset balance. And although we had stopped the process by the evacuation of the fluid, there was still too much fluid within the spaces, and by the lumbar puncture the proper balance was re-established.

From this case we can say that in frontal lobe meningitis the advisable procedure is to make a large incision thoroughly exposing the dura, which should be nicked to let out the infected fluid. We must not be afraid of a small opening in the dura. I think that in the presence of an infection in the bone a protective process occurs that not only makes the dura thicker but causes an immunity within the dura, thus preventing infection when it is opened. I believe it is safe to open the dura through an area of infection, although it is not safe to open a clean area with a dirty instrument. Otologists have been too afraid of the dura in the presence of an infected process. However, the pia or the brain should not be injured.

Further facts about frontal lobe infections were derived from the following case:

A man fractured his skull; following which he had a rhinorrhea, with the discharge of a large quantity of fluid from his nose. All the cases of rhinorrhea that I have seen ultimately ended fatally; so I suggested to him that we place a piece of fascia lata between the dura and the cribriform plate with the idea that it might stop the loss of cerebrospinal fluid. I had never known it to be done. While we were discussing it, the rhinorrhea stopped.

Some months later I was summoned to a general hospital, where I found this man in deep coma. The fluid from a lumbar puncture was slightly cloudy. At the same time an occipitoatloid puncture was performed. When the two tubes were held up to the light, the one from the lumbar region was so much clearer than that from the base that it was hard to believe they were taken from the same patient.

At autopsy I expected to find that the cerebrospinal fluid had been leaking through a fissure in the cribriform plate but, much to our amazement, on the removal of the skull cap we came to a fracture of the inner wall of the frontal sinus. The mucous membrane of the sinus looked as if it had been washed with water, it was so clean. On incising the brain we exposed what was apparently a large ventricle. The pathologist said, "The man has been emptying his ventricle through his frontal sinus." But closer examination of the apparent ventricle revealed it to be a large hemorrhagic cyst from pia invagination, situated entirely below the ventricle, which latter was compressed by the cyst. During life the patient every now and then would empty the cyst through his nose, and when it was nearly emptied the flow would stop. This went on for ten months after the injury before he died.

Why should a small hole in the posterior wall of the frontal sinus continue for ten months with an opening into an enormous cyst (which held at least 2½ ounces of fluid), and never close? The answer is that fracture of a bone that has no movement between its disconnected surfaces does not close by bony union. Fractures of the frontal bone close by fibrous, not bony union as the fragments lie perfectly flat together, side by side, without movement. In addition to being of this type, if the fracture invades the frontal sinus, union may be further prevented by the leakage of cerebrospinal fluid. The bone does not close, and so the fluid may continue to leak a little through a small fracture.

What is the surgical lesson to be derived from this case, and what is its application to meningitis? It would seem to me that if an infection in the frontal sinus has eroded through the posterior wall (as found at operation), no good will be accomplished by simply removing the anterior wall. The sinus as a whole must be obliterated. If an infected frontal sinus combined with head symptoms is opened, all the bone should be removed; for if the bone itself is infected, it may ultimately light up a fatal meningitis.

Why is infection of the frontal different from that of the temporal lobe? Because the mechanism of protection is entirely different. When we destroy by surgical operation the mucous membrane in a frontal sinus disease, we have destroyed nature's protective process. It is much better to take away the bone itself from the posterior wall than just to remove the mucous membrane and leave a bone that is apt to die and is pretty sure to become infected in the process of dying.

I had another case of frontal sinus disease that gave a suggestion about the chronicity of meningitis.

The patient had had chronic suppuration from his frontal sinus and ethmoids; he had been subjected to two radical operations—with great disfigurement. The suppuration had stopped but he still complained of violent pain in the frontal region. We refused to operate because of the lack of suppuration. He was an ex-soldier, and several who had examined him considered him a malingerer. Finally another operator, who had better judgment than I had, opened the old wound to see if there might not be confined pus, and liberated it directly on the dura.

Now as regards otitic meningitis, how can it be cured? In my opinion, the only way is to find out exactly where the infection is and then remove it in the early stage, while the infection is limited to the region adjacent to the area of infection in the bone. If we can decide early enough how the infection has entered, remove that part of the bone, and open the dura at the proper place, we ought to cure many of our cases.

Clinically, otitic meningitis cases can be divided into three groups: *1.* Cases secondary to sinus thrombophlebitis; *2.* middle fossa cases, in which the infection goes through the tegmen tympani to the middle fossa; and *3.* the labyrinth cases, in which the infection usually enters by way of the internal auditory meatus.

There are cases of ductus endolymphaticus—cases recognized as such at post-mortem. I do not know how to recognize them clinically.

How can the different cases be diagnosed?

LABYRINTH CASES.

The majority of cases of meningitis that have been cured have followed an infection of the labyrinth. They have been cured by evacuating the fluid through the labyrinth. In a labyrinth operation when the modiolus is approached there is seepage of fluid through it into the vestibular cavity. I believe the labyrinthine fluid is normally formed by seepage through the modiolus.

Clinically then, the labyrinth system can be regarded as an outpost of the cerebrospinal fluid system, connected with the main body (of the system) by small openings in the modiolus by way of the internal auditory canal. Politzer described, in cases of otitic meningitis, a zone of exudate just inside the internal meatus; which exudate unites the fibres of the nerves and vessels entering the meatus together in one large mass of tissue. He recorded this pathological picture over thirty years ago, but no one paid any attention to it. What does it mean? It means that in the labyrinth cases in which the infection is within the vestibule, nature tries to wall off the process from the general subarachnoid space by building a barrier in the narrow prolongation (of the subarachnoid space) that projects into the auditory meatus.

What are the particular subarachnoid spaces involved in meningitis following labyrinth suppuration? If pigment be injected through the internal auditory meatus of a cadaver (the same route that infection follows in suppuration of the vestibule), it runs back toward the median line of the base—enters the cisterna interpeduncularis. Now in labyrinth suppuration, if an opening is made into the subarachnoid prolongation of the internal auditory meatus and the infected fluid is evacuated at an early stage of meningitis, the patients should be cured. I have cured a few by opening the internal auditory meatus and so entering the cornucopia-like prolongation of the cisterna pontis, which connects with the cisterna interpeduncularis.

Thus we can say that in a patient in whom a labyrinth is dead and there are symptoms of meningitis, the internal auditory meatus must be opened at an early stage.

However, if the meningitis comes from an infection of the lateral sinus, it is a different proposition, for now the infection is in a different part of the cerebrospinal fluid system. Davis, of London, demonstrated that if you inject a colored fluid around the lateral sinus, it *does* not go toward the cisterna interpeduncularis but takes a different course; it runs over the base of the brain and comes out of the cisterna magna. In such a case, if a needle is placed in the occipitoatloid region, colored fluid is obtained. So, in cases of meningitis from lateral sinus thrombophlebitis we should make an opening in the dura near the lateral sinus and also drain the cisterna magna.

MIDDLE FOSSA CASES.

What can we do for middle fossa cases? What is the source of infection in such cases? In my opinion, it is always a thrombophlebitis of a small vein; one that goes through the tegmen tympani or antrum. These cases give a distinct clinical picture and present a certain group of symptoms caused by involvement of the nerves which pass forward near the cavernous sinus, especially the fifth. Consequently, the patients are apt to have pain from one or the other branches of the fifth nerve, chiefly around the eye, associated with a little fever and considerable dull headache; and then they suddenly see double. In a case of this kind if we open the bone widely, make a small opening through the dura of the middle fossa, deep in towards the median line, we are apt to get a large amount of infected fluid. Following this operation a considerable number of my cases have gotten well and remained so.

For a long while I did not know why in one case I got fluid and again, not. I thought it was because I was not opening at the same place. But I now believe that it depends upon the presence of adhesions and anatomical variations in the lateral prolongations of the

basal cisterna. If the inflammatory process has united the subarachnoid tissue and obliterated the spaces, when they are opened there is no fluid at the site of the dural opening. We know now that the subarachnoid spaces are very variable in their normal extent; and as yet we have no definite rules so that we can know exactly where a certain space is located. The pia-arachnoid is a low grade tissue, and like all low grade tissue it is very variable in its position; consequently, if we do not at first get fluid it does not necessarily mean that we are not attacking an infected area. In patients in whom there is no fluid, some of them should have the dura opened widely; but I do not know as yet how to distinguish which cases need this more radical procedure.

But, you will tell me, many patients with oculomotor paralysis get well without operation. In fact, only 18 per cent of cases of Gradenigo's syndrome die if they are let alone. But why do 18 per cent die? The Mayo Clinic reports four cases of papilledema; the diseased bone over that area was taken away, and the papilledema disappeared. In one case, the dura was opened and nothing found. Does this mean they did not have meningitis? My idea is that all patients with Gradenigo's symptoms, even if they get well, have meningitis; if it is a severe type, it ultimately causes general suppurative meningitis and proves fatal. In the milder cases, if the area of infected bone is removed the meningitis subsides, and the patient recovers. But the very fact that there is a sixth nerve paralysis shows there was some process within the dura.

What is my policy in regard to deciding whether to open the dura or not? If I have a case of Gradenigo's syndrome and after taking away all the diseased bone, find the patient becomes progressively better, I leave him alone. But if the oculomotor paralysis and pain still continue, I open the dura of the middle fossa by a small cut and let out the fluid. In this way a considerable proportion of patients have been saved.

MENINGITIS SECONDARY TO THROMBOPHLEBITIS OF A LARGE BASAL VENOUS RADICAL.

Minute herniation of the brain into the large basal sinus may be the cause of meningitis. That such herniations occur has been demonstrated microscopically. What is the lesson? When opening a sinus for otitic pyemia, we should be careful not to curette the sinus; but should lift out the clot, not curette it out. If it has stuck to the wall, let it stay; because if it is curetted out, the operation may set up a meningitis; however, if the sinus is filled with a clot, what will not come out of the sinus should be freely incised and the clot allowed to slough out. I am certain that is the right procedure.

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OSSICULECTOMY IN THE TREATMENT OF CHRONIC PURULENT OTITIS MEDIA.

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Before the advent of the radical mastoid operation, various operative methods were used in the treatment of chronic purulent otitis media, but it seems to be the usual practice among the otologists of today to employ either conservative medical treatment or radical mastoidectomy with the exclusion of practically all forms of conservative intratympanic surgery except the removal of aural polyps and excessive granulation tissue by means of the snare.

Callison[1] reports over 75 per cent of his cases cured by medical means. His method of treatment is quite simple and consists of douching with boric acid solution or removing the pus from the canal with a cotton-tipped applicator, slight suction and the application of strong silver nitrate or trichloracetic acid solutions for the destruction of granulation tissue. In addition patients are given a ½ per cent solution of mercurochrome, 220 soluble in 50 per cent alcohol or a mixture of phenol, tincture of iodin, alcohol and water for home use.

Wagers[2] reports over 50 per cent of his series of chronic purulent otitis media cases cured by various medical methods, such as thorough cleansing, slight suction and the use of zinc ionization, mercurochrome, arkase or the ultra violet rays. His conclusions are that the suppuration responded about equally well to zinc ionization, mercurochrome and arkase and that constant and thorough cleanliness is most important.

According to the above statements, medical methods have a distinct value in the treatment of chronic aural suppuration. Between 50 and 60 per cent of these patients respond to careful and persistent medical treatment. The remaining 40 or 50 per cent are doomed to go through life with a constant or intermittent otorrhea, impaired hearing and the dangers of intracranial complications unless radical mastoidectomy is performed.

Many patients are found in the clinics and in private practice on whom it is not advisable to perform the radical mastoid operation for various reasons. It may be that they will not consent to such a hazardous operation or that their constitutional condition will not allow it or that they do not wish to undergo the long and tedious

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postoperative care. Regardless of the reason, it is a fact that, considering the large number of chronic purulent otitis media patients, not many radical mastoidectomies are performed.

Much has been written, especially in the latter part of the nineteenth and the beginning of the twentieth centuries, concerning the value of ossiculectomy. Originated in 1875 by Schwartze, ossiculectomy was almost the sole operative means of dealing with chronic aural suppuration. The great value of the radical mastoid becoming known, ossiculectomy was slowly and surely discarded until at the present time, especially in this section of the country, the operation is virtually unknown and not attempted by the younger otologists. Page[3] states that only one ossiculectomy is recorded at the Manhattan Hospital in the past ten years and none are on the records of the New York Eye and Ear Infirmary. The pendulum is swinging too far in the opposite direction and ossiculectomy is wrongly ignored. Those patients who do not respond to medical treatment should not undergo the radical mastoid operation unless there is evidence of chronic mastoiditis or some contraindication for ossiculectomy. The patient should receive no definite promise regarding cure and if ossiculectomy fails, no damage has been done and one step in the radical mastoid has already been completed.

A great difference of opinion exists as to the value of ossiculectomy. Quoting Sir Charles Ballance:[4] "The mere persistence of chronic aural suppuration is the indication for the complete mastoid operation, though all cases, it is true, are not equally urgent. Such measures as curetting away granulations, removal of polypi, excision of ossicles, are, I still consider, not only inefficient but dangerous in all but a few, quite exceptional, cases."

Kerrison[5] states that he has never seen a case in which he felt justified in advising ossiculectomy, but can conceive of many cases in which it might prove successful. Milligan[6] reports that 32 per cent of his cases of ossiculectomy had suppuration recur after intervals of from four months to two years, necessitating the performance of a more radical operation.

A great number of reports stating ossiculectomy to be a success can be found in the literature. Ludewig reported 42 cures in 75 cases and the incus was found to be carious in 85 per cent of the ears operated upon. Grunert cited 13 cures in 28 operations. Dench[7] reported 53 patients cured, 25 improved and 2 unimproved in 92 cases operated upon. In the remaining 12 cases the results were unknown. In this series the discharge ceased in six to eight weeks and facial paralysis occurred in one patient following operation. In

Dench's first series of 29 cases the incus was carious in 19 patients and it was completely destroyed in 8 patients. In this series 15 patients were cured and the discharge was greatly reduced in 9 patients. Dench in the discussion of Dr. Page's paper states that he now prefers radical mastoidectomy in the operative treatment of chronic aural suppuration. Sexton[8] reported 15 patients cured, 13 improved, while in one the results were unknown, in 29 patients operated upon. Eleven of these patients showed marked improvement in hearing. The malleus and incus were both removed in 19 patients, the malleus only in 7 patients and only the incus was removed in 3 patients. They also had special attention directed to nose and throat conditions and carious teeth. Seventy-one patients had ossiculectomy performed in Sheppard's[9] series of 600 cases of chronic purulent otitis media. The length of time of the discharge varied from one year to more than twenty years. He reports 84 per cent cured by ossiculectomy and 15 per cent not cured. Randall,[10] in 1894, had 5 cures in 15 patients, but the ears were slow in healing and were cured as much by other means as by excision of the ossicles. He further states that he has never had any improved hearing as a result of ossiculectomy. Tod's[11] article, in 1910, reports 52 per cent cured and 30 per cent improved in a series of 120 cases. In addition to removing the malleus and incus and curetting the granulations from the tympanic cavity and the attic he also removed the outer wall of the attic. The average amount of hearing after the removal of the malleus and the incus in his patients was 12 feet for conversation. Davis[12] reports a case in which the ear operated upon was dry for five weeks and then began discharging. In the discussion which followed Grant advocated the removal of the ossicles when the membrana tympani is destroyed to any great extent and the hearing much reduced and when the ossicles are perhaps glued together and only acting as an obstruction to drainage. Milligan and Horne stated that ossiculectomy was disappointing and believed that disease of the attic is invariably associated with disease of the antrum.

Indications for Operation. Chronic suppuration which does not respond to treatment and has no urgent need of radical mastoidectomy.

Demonstration of definite caries of the ossicles is usually difficult. Schwartze[13] stated that the long process of the incus, the short process and finally the corpus incudis become necrotic in the order named. Of the malleus the head is usually necrotic before the manubrium. The manubrium of the malleus is usually the last portion of the ossicles to become necrotic; hence, visual evidence of

necrosis usually means that the caries is much advanced. At the time of operation the incus may have been entirely destroyed and cast out in small particles. The reports of many competent otologists contain remarks showing that the incus was not found after a careful search of the attic. Both crura of the stapes are occasionally lost through necrosis, but the footplate usually escapes because of its free blood supply from the vessels of the labyrinth. Total or partial removal of the stapes is not needed for the promotion of drainage.

Perforations of Shrapnell's membrane do not allow proper drainage because of their high position. They are apt to become closed within the tympanum by the ossicles and mucosal folds and externally by dried pus closing the perforation. These perforations quite often indicate caries of the incus.

Granulation tissue and polyps blocking drainage call for their removal by the snare, curette or chemicals or a combination of all three. The ossicles should be removed at this time, since the granulation tissue often springs from a carious ossicle or from the mucosal folds of the attic, which will be curetted at the time the incus is removed. Polyps arising from a fistula of the superior posterior canal wall point to mastoid involvement.

Obstruction to drainage by the swelling and necrosis of the contents of the epitympanic cavity, Freer, according to Haskin,[14] states that the mesatympanum forms an undivided, single, easily drained cavity of comparatively simple form and readily opened for direct drainage if the pars tensa of the membrane tympani be perforated; the attic is subdivided into a number of compartments with easily blocked intercommunications. Haskin believes that ossiculectomy should always be resorted to whenever definite caries of the ossicles can be demonstrated and when they, with their bands of adhesions and ligamental folds, act as an obstruction to the proper drainage of the attic and antrum.

It is readily seen that the indications for operation are indefinite and really depend upon the judgment of the otologist.

Contraindications. Cholesteatoma. The presence of cholesteatoma in any case of chronic purulent otitis media calls for the radical operation.

Exudative mastoiditis as shown by the X-ray and clinical evidence should have radical mastoidectomy performed.

Intralabyrinthitis and intracranial complications need scarcely be mentioned as contraindications.

An acute exacerbation of chronic purulent otitis media should not be subjected to ossiculectomy.

The presence of good hearing, as an arbitrary distance, 12 feet may be mentioned, is a contraindication. If the operation is performed, the patient should be warned that there may be some diminution in hearing.

Dangers. The dangers of intratympanic surgery are well named by Fenton.[15] "The facial nerve, scarcely covered by its shell-like ridge, swings just above the stapes and oval window; the chorda tympani traverses the anterior and posterior folds crossing the neck of the malleus; the exposed promontory may resemble a reddened and bulging tympanic membrane; loosened ossicles may be lost in the hypotympanum or the aditus; polypi may cover bony fistulae leading to the brain or the labyrinth; cholesteatomatous pressure may have caused bony erosion over the dura or the jugular."

Technique of Operation. The choice of anesthesia depends upon the patient and the judgment of the surgeon. Local anesthesia is the method generally used unless a general anesthetic is indicated by the excessive nervousness of the patient, extreme sensitivity of the drum membrane and the intratympanic structures or the belief that the operation will be long and tedious, due to adhesions, etc. The patients to be reported were operated upon by local anesthesia with the exception of the one operation performed by Dr. George M. Coates. This patient, a man age 55 years, was so extremely nervous that it was necessary to use gas oxygen anesthesia. At this time I wish to express my appreciativeness to Dr. Coates for his encouragement and aid in the preparation of this paper.

All purulent material is removed from the external auditory canal by careful syringing with boric acid solution or a 1-6000 bichlorid of mercury solution. The canal is then carefully dried with cotton wound on an applicator and an 85 per cent solution of alcohol is dropped into the canal and allowed to remain for a few minutes, when the canal is again carefully dried. If much of the membrana tympani remains, anesthesia is best obtained by placing cotton saturated with Bonain solution (equal parts of menthol, cocain and phenol) in close apposition to the drum and allowing it to remain for 10 to 15 minutes. The superior, posterior and inferior canal walls are now injected with a 1 per cent solution of novocain to insure deeper anesthesia. The needle is placed under the skin and periosteum of the canal close to the membrana tympani. This injection may be painful as there is a tendency for the needle to tear through the tightly adherent skin, but this difficulty is overcome if a small gauge needle is used.

If a large portion of the membrana tympani has been destroyed, the canal is partially filled with a mixture of equal parts of cocain,

10 per cent, and adrenalin, which is allowed to remain about ten minutes to provide intratympanic anesthesia. When the perforation is small, this solution is not placed in the canal until the membrana tympani has been excised. With careful anesthesia, incision of the membrana tympani is not painful. The membrane which has been involved in a chronic purulent process is usually not very sensittive, but exceptions are found and pain may be quite severe.

The incision of the membrana tympani is accomplished by means of a myringotomy knife and the remains of the membrane are freed from the malleus and annulus. The incision is begun at the lower end of the malleus and is continued along the anterior border to the upper portion of the membrane, from which it follows the annulus around to the posterior border of the malleus. The malleus may be retracted and adherent to the inner wall of the tympanic cavity. The malleus is freed from these adhesions with a Schwartze tenatome (right and left), which is also used in cutting the tendon of the tensor tympani muscle. This is accomplished by introducing the tenatome below and behind the manubrium and, with the sharp edge upward keeping close to the malleus, the tenatome can usually be felt cutting through the tendon. The handle of the malleus is now grasped with a Sexton or Hartman forceps and downward traction is made, breaking the remaining attachments. The malleus is now removed.

Many operators use the sharp upward cutting ring curette of Delstanche-Brunschwig to cut the tensor tympani tendon and adhesions. The ring curette encircles the lower end of the malleus and is pressed upward as far as possible, severing ligaments, adhesions, tensor tympani and anterior and posterior malleolar folds. Brunschwig's sliding lock is now slipped down, firmly seizing the neck of the malleus and facilitating delivery as soon as the upper attachments are sectioned. The neck of the malleus must not be fractured in its delivery or the extraction of the head may be quite difficult.

Perkins[16] states that in ossiculectomy there is invariably loss of taste perception in the anterior two-thirds of the tongue on the operated side for some time. This is to be expected since the chorda-tympani nerve lies between the malleus and the incus and would necessarily be ruptured during their removal.

The incus may be removed with the malleus when inflammatory processes have caused the two to become adherent. It has not been found necessary in any case to separate the incudo stapedial articulation in the removal of the incus. However, if this articulation is soon, it may be severed as a preliminary procedure.

Many types of incus hoops may be used in removing this bone. Loeb[17] mentions that he has often removed the incus by introducing an angled Hartman forceps into the attic, grasping the incus and pulling it down. In these cases a Ludwig's incus hook, of which there is a right and a left, is inserted so that the hook is directed upward, having its concavity backward. The instrument passes into the attic at the point previously occupied by the head of the malleus. The shaft is then rotated backwards so that the hook passes over the body of the incus. The body of the incus lies hidden behind the superioposterior rim of the annulus and cannot be seen, but the hook will be felt to engage a yielding bony surface. The rotary motion is continued downward and finally forward so that the incus is dislodged and forced into the tympanic cavity. It is then removed with a suitable forceps.

An alternative method for the removal of the incus is the opposite rotation of the hook. The concavity of the hook is directed upward and forward and the hook is inserted below and behind the incus, rotating the ossicle forward and downward into the tympanic cavity.

A long search may be required to find and remove the incus, but failure in this respect will naturally detract from any good that may result from the operation. It must be borne in mind that the incus is often lost in the effort of nature to rid the tympanic cavity of diseased bone.

The successful removal of the incus completes the operation with the exception of light curettement of the attic with a small, sharp spoon curette to remove any granulation tissue and break up any adhesions which may be obstructing drainage. No effort is made to remove the outer wall of the attic or the annulus since, if this procedure is considered necessary, it is best to do a thorough radical operation. No curettement of the Eustachian tube was practiced, although a higher percentage of cures will undoubtedly result if the tube can be successfully and permanently closed so as to exclude any possibility of reinfection from the nasopharynx.

The incus must not be pushed into the aditus and antrum during attempts to remove it or it may be lost entirely. Hemorrhage is usually not excessive and is controlled with adrenalin or by packing the canal with gauze. Facial paralysis may occur if the incus hook is not rotated high enough in the attic or it may result from too strong curettement of the granulation tissue. Injury to the stapes must be avoided during operation or a suppurative labyrinthitis may result.

The postoperative treatment consists in packing the external canal with sterile gauze, which is removed in twenty-four hours. The patient should remain in the hospital for twenty-four hours following operation.

Future treatment depends upon each individual case and is adapted to the needs of the patient. It frequently happens that a rather profuse discharge exists for a few days following operation and this should be removed by syringing with boric acid solution. A scanty discharge may be removed with a cotton-tipped applicator. Granulations are controlled with strong solutions of silver nitrate or trichloracetic acid. The middle ear cavity may be dusted with boric acid powder.

Case 1: C. S., white, male, age 24 years. There was a history of discharge from the left ear since childhood. Impaired hearing in the affected ear. Subject to frequent attacks of rhinitis and tonsillitis.

Examination: The membrane tensa is almost entirely destroyed and the malleus is retracted and adherent to the inner tympanic wall. Hearing for the voice is 5 feet.

He was treated for two months with a very slight amount of decrease of the discharge. The tonsils were removed during this time. On Dec. 2, 1924, the malleus and incus were removed under local anesthesia. The ossicles were not distinctly carious.

Result: The discharge gradually became less and on Jan. 25, 1925, ceased entirely. No discharge was present for two months, but on March 11 he developed a slight rhinitis with a slight amount of discharge from the left ear. On April 2 he developed an acute and severe nasal condition, with a yellowish, purulent discharge mostly from the left side of the nose. Left antrum puncture was negative. At this time there was a mucopurulent discharge from the left ear. He was last seen on April 23 and there was a slight amount of aural discharge. Hearing for the voice is 5 feet.

Case 2: J. M., white, male, age 55 years. Complained of foul discharge from the left ear. It was impossible for him to tell the duration of the discharge. Impaired hearing.

Examination: A moderate sized perforation, from which there is a foul discharge exuding, is present in the posterior interior quadrant. Hearing for the whisper is 6 feet.

X-ray report: The left mastoid shows a diffuse, dense sclerosis of a degree and type evidencing a definite chronic mastoiditis.

Operation on Dec. 16 by Dr. George M. Coates under gas oxygen anesthesia, due to extreme nervousness of the patient. The malleus and incus were removed and both were necrotic.

Result: By Dec. 27 there was no discharge from the ear. Patient was last seen about the middle of January and he reports no discharge from the ear. Hearing unchanged.

Case 3: A. B., white, female, age 39 years. There was a history of intermittent otorrhea from the left ear for the past four years. The discharge ceases at times, but begins again following pain. Present discharge has persisted for two months. Right ear discharged during childhood. Moderate impairment in hearing.

Examination: Moderate sized, horse shoe perforation in the posterior inferior quadrant from which a yellowish discharge exudes. Hearing for the voice is 18 feet. Right membrana tympani is retracted and irregular.

X-ray report: Definite evidences of mastoiditis of both processes. Dense sclerosis with a blurred outline of bone structure. Practically no evidence of cellular outline on either side. General appearance is that of chronic mastoiditis.

Patient was operated upon under local anesthesia on Jan. 13, 1925. Incus and malleus removed, slightly carious.

Result: Gradual cessation of the discharge until Feb. 6, when it ceased entirely. Patient was last seen on Feb. 19 and there was no discharge. Hearing for the voice is 14 feet.

Case 4: H. H., white, male, age 16 years. Chronic bilateral otorrhea, worse in the left ear, accompanying measles at age 2 years. The hearing is greatly impaired.

Examination: Both membrana tensa are destroyed and there is a foul discharge in both canals. The lower end of the malleus is destroyed. Hearing for the voice is 6 feet in the left ear, and 7 feet in the right ear.

The left ear was operated upon Feb. 3 under local anesthetic. The malleus was difficult to remove and the neck was fractured. The head of the malleus was finally removed, but the incus was not found after a long search.

Result: Granulation tissue controlled with silver nitrate. The discharge slowly decreased in amount, but on March 19 there was a profuse discharge following uncleanliness of the ear. On April 28, date last seen, there was still a considerable amount of discharge. Hearing for the voice in the left ear is 3 feet, and in the right ear is 5 feet.

Case 5: Mrs. E. G., white, female, age 33 years. Intermittent discharge from both ears, the left being far worse, for thirty years. Cause unknown. Aural polyp removed from left ear in 1905. Continuous discharge for past seven years. Slight impairment in hearing.

Examination: Both membrana tensa destroyed and the mallei are retracted and adherent to the promontory. Hearing for the voice in the right ear is 18 feet, and in the left ear is 15 feet.

Operation was performed on Feb. 14, 1925, under local anesthesia. Malleus and incus, very necrotic, of left ear removed. Granulation tissue in attic removed. Difficulty in extracting incus.

Result: There was still a slight amount of discharge from the left ear on April 30. Excessive granulation tissue is present in the posterior portion of the tympanic cavity and is being controlled with silver nitrate solution. Hearing for the left ear is 6 feet.

Case 6: J. G., white, male, age 29 years. Complained of a discharging right ear for the past five years. Moderate impairment of hearing.

Examination: The canal was filled with foul pus and in removing it, the incus was found in the floor of the canal. The malleus was retracted and the lower end destroyed. The greater part of the tympanic membrane was destroyed. Hearing for the voice was 5 feet.

Operated upon on March 2 under local anesthesia. Marked necrosis of the malleus. was found.

Result: By April 1 the discharge had entirely ceased. Two weeks later the ear was still dry and since then the patient has not returned to the clinic. Hearing unchanged.

Comments: These patients had conservative medical treatment without results.

In this series of six cases there were three patients apparently cured, two improved and one unchanged.

In Cases 2, 3 and 6 the discharge stopped in two, three and four weeks, respectively.

The malleus or incus or both were necrotic in all but one patient.

The incus was not found in one patient and it is this ear which has not responded to treatment.

The hearing was not improved in any patient, and in two patients the hearing for the voice decreased from 15 feet to 6 feet, and from 18 feet to 14 feet.

In Case 1 the discharge ceased for seven weeks, but began again with a severe acute rhinitis.

No patient showed any regeneration of the membrana tympani.

All patients were able to perform their accustomed work in a day or two following operation.

No untoward effects were experienced by any patients.

Conclusions: Ossiculectomy appears to deserve a place in the surgery of the ear. The types of chronic purulent otitis media which

do not respond to careful treatment and which do not have any contraindications for ossiculectomy should have this minor operation, as compared to radical mastoidectomy, performed. If the patient is not cured, the radical operation may be undertaken later. No promises of cure should be made to a patient as there is, at least, a 50 per cent chance of failure. If the hearing is only slightly impaired, the patient should be warned that there may be a decrease in the hearing. Successful closure of the Eustachian tube would probably minimize reinfections.

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1811 Spruce Street.

THE EVOLUTION OF THE SUBMUCOUS RESECTION WITH NEW TECHNIQUE.

Dr. D. T. Atkinson, San Antonio, Tex.

It has been only in recent years that nasal obstruction with its sequelae of sinus, pharyngeal, and ear infections has received anything like appropriate attention from the medical profession. The pathology of the nose, until a few years ago, was little understood and the great number of abnormal conditions incident to obstructed nares were explained away with a positiveness which later years have made absurd. With good illumination and the head mirror, which is only an invention of yesterday, came a greater interest in the nasal passages as well as the recognition that any condition that makes the nose deviate from a normal standard has attending it a chain of symptoms of a troublesome or, more often, a disastrous nature.

Though for a number of years the process of evolution has been rapidly at work in intranasal surgery it is possible that the Asch operation was the first procedure, for correcting obstructed breathing, that was attended by any favorable results, whatsoever; and the benefits derived from this method of straightening the septum were usually fleeting, as the septum in nearly every instance resumed its former contour after a few months or less time had elapsed.

The Asch method of straightening the septum was soon supplanted by a procedure originated by Bosworth, an operation by which attempts to reduce obstructions were made by sawing away projecting surfaces. The method of Bosworth always left its foundation for impacted incrustations with their attending discomforts and was soon abandoned. The results obtained from removing spurs with the spokeshave were even less favorable than were those following the sawing operations, for usually large areas of mucous membrane were abraded or scraped away by the instruments.

Coeval with the Bosworth sawing operation grew up the practice of removing turbinals. We, of the older surgeons, all remember with something of a shudder the relentless destruction of the inferior turbinals of twenty years ago, done with a view of establishing normal breathing spaces in the nose. Because this much at least was accomplished the procedure swept like a tidal wave over the country. It is likely that no other operation upon the head has been attended by such disastrous consequences and persons maimed by the inde-

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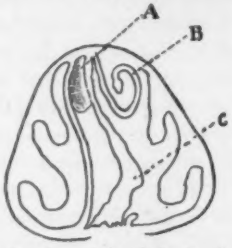
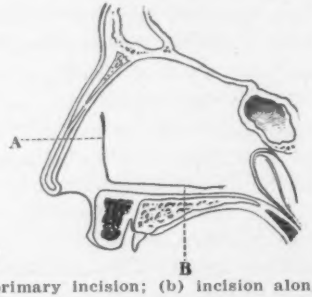
scriminate removal of turbinals may be found among the patients of nearly every rhinologist today.

It is probable that Watson should have the credit for taking the step which eventually led to the modern submucous resection, as the idea seems to have been originated by him that certain limited areas



Cross-section of nose, showing (a) pledget of cotton tucked between opposite flap and septum. (b) Primary flap rolled. (c) Deviated septum.

Showing flap rolled up and tucked between septum and middle turbinate.



Showing (a) primary incision; (b) incision along floor of nose.

of a deviated septum might be removed from beneath an elevated mucous membrane. Watson's method was later improved upon by Gleason, though it never occurred to either of these surgeons that the greater part of the septum might be safely removed, nor did they

develop anything like the modern technique in their surgery upon this structure.

The operation from which our modern submucous resection has been evolved cannot be said to date back more than twenty-five years. At this time very little of the original technique of the operation remains, with the possible exception of the removal of the cartilaginous septum with the swivel knife. Nearly every surgeon has carried his operation through the successive steps which have been later introduced without realizing, perhaps, that the technique he employs today makes the operation essentially different from the one he did a dozen, or fewer years ago. He will note, however, that the results obtained by him at this time are immeasurably better than they formerly were.

It is not my purpose in this paper to outline the various steps of the submucous resection. It may be that no two surgeons do the operation entirely alike, everyone seeming to develop a certain individuality in his own technique. I have observed that in the hands of many good surgeons, though there is a great variation in the technique, their results are usually good. I wish only to call attention to two steps that seem to me to be of advantage to the nasal surgeon. I do not claim originality in either of these methods. It is possible that they have been used by other surgeons, though I have never seen them reported.

One of the steps that I shall try to describe I shall allude to as "rolling the flap" for the want of a better term. The other has reference to getting the flap on the side opposite to the primary incision entirely out of the surgeon's way. Both steps are easily taken and I feel that one who uses them may find them so advantageous that he will not revert to his previous methods of taking down the septum.

My initial incision, made from the side toward which the septum is deviated, extends from the roof of the nose downward about 1½ c.m. from the nasal orifice, the position and direction depending upon the location and character of the deviation. There seems to be very little difference in these primary incisions as made by nasal surgeons with a modern technique. They all seem to have gotten away from their early mistakes of making the incision too far forward and taking out too much of the cartilaginous septum, thus weakening the support of the nose and, in some instances, ending in a deformity more or less noticeable.

After the primary incision is finished a second incision is made along the floor of the nose, extending backward as far as the beginning of the posterior one-third of the septum. This incision may be

made with any of the small oval-bladed knives on the market. Considerable pressure should be exerted, while making it, for the mucoperichondrium at this point is dense and must be freely divided. There being a bony background throughout, no danger of penetrating to the opposite side exists. A thin elevator is now inserted under the mucous membrane and perichondrium adjacent to the initial incision and is gently pushed upward and downward until the mucous membrane and perichondrium are elevated from the cartilage. The remainder of the flap is freed from the septum by a heavier blunt elevator and the flap, then hanging free, is rolled upon itself and is tucked between the middle turbinal and the septum. This maneuver, in my hands, has never been attended by hemorrhage at the time of the operation, and seldom following it. The septum with the flap turned out of the way becomes thereby unusually accessible, and much more easily removed.

After the mucoperichondrium and mucoperiosteum, from near the cribriform plate of the ethmoid downward and backward, are elevated from the initial side and rolled upward as just described, the incision is carried through the cartilaginous septum in the usual manner. The opposite flap is now separated and pushed outward away from the septum and toward the middle turbinate. A small pledget of cotton is then placed between the flap and the denuded septum. The cotton pushes the flap away from the septum, making it hug the middle turbinate. This step in the operation gives the surgeon a complete view of his field and does away with the possibility of wounding or tearing the opposite flap. With the primary flap rolled up against the middle turbinate, and with the opposite flap pushed aside as described, it will become obvious at once that a tear of the membrane on either side is now practically impossible.

In the remainder of the operation the usual technique is employed. After the septum is removed the primary flap is made to roll downward, and after its edges are coapted the nose is dressed. To control the possible serious hemorrhage, which I have never experienced however, I apply an elongated pledget of cotton, previously squeezed out from 1-1000 bichloride of mercury solution, to the incision at the floor of the nose. The remainder of the packing is of gauze and is applied in the usual way. The packing is removed the second day.

Since resorting to this method of removing the septum, besides the immeasurably better view of the field of the operation obtained, I have found that the septum is taken down with much greater facility. Especially does this apply to the vomer. With the flap elevated and out of the way the chisel, or whatever instrument is

used, may be applied at an angle rather than directly to the end of this structure, where it partly cuts and partly fractures it from its lower attachment.

The advantages which I have observed attending the method which I have attempted to outline in this article when summed up are:

1. The method shortens rather than lengthens the time consumed by the operation.
2. Gives much better visibility of operative field.
3. Provides greater ease in removing the upper septal wall.
4. Facilitates removing the vomer.
5. There is less likelihood of tearing or perforating the septum.
6. Prevents to a greater degree formation of clot between the mucous walls.
7. Gives better drainage.

827-33 Medical Arts Building.

SPONTANEOUS RUPTURE OF A RETROPHARYNGEAL ABSCESS, FLOODING OF THE TRACHEOBRONCHIAL TREE; TRACHEOTOMY; ASPIRATION; RECOVERY.

DR. M. C. MYERSON, New York.

The emptying into the tracheobronchial tree of a ruptured retropharyngeal abscess is extremely rare. Frank[1] mentions Justi and Gaupp as each having reported such a complication with fatal consequence. Despite the fact that such a possibility is mentioned in some of the textbooks, one is not likely to think of it when confronted with an esphixiating infant, without a significant history.

Such was the case that presented itself late one evening last January when I was summoned into the emergency room of a hospital (U. I. Zion). I was shown a baby boy, age 8 months, pale and perspiring, and being given artificial respiration. The infant had been brought into the hospital a few minutes before by his mother, who related that he had been under treatment for a "cold" during the past five days.

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On inspection there was noted a swelling of the glands on the right side of the neck. There was marked suprasternal, intercostal and infrasternal retraction. An index finger introduced into the pharynx was covered with thick pus on removal. A diagnosis was made of a spontaneous rupture of a retropharyngeal abscess, because of this finding, and the cervical adenitis, it was reasoned that the respiratory difficulty was to be accounted for by a flooding of the tracheobronchial tree with the contents of the abscess.

Inasmuch as a laryngoscope or bronchoscope, and suitable aspirating tubes were not available, a hurried tracheotomy was performed. A treacheotomy tube was inserted and a catheter attached to a suction apparatus was passed through it. In this way a considerable amount of pus was evacuated from both bronchi. During all this manipulation artificial respiration was maintained.

The tracheal tube was removed in 48 hours, and the child was discharged as recovered on the sixth day.

Considerable difficulty may attend the diagnosis of retropharyngeal abscess. There are, however, certain clinical features which most of these cases present, and which were to be seen in this case. The patient refuses nourishment, breathes with difficulty, and is restless. The glands on the same side of the neck as the abscess are enlarged. In the later stage there is the appearance of severe illness. Perspiration, pallor or cyanosis, and an increase in the flow of saliva and mucus from the mouth are prominent symptoms. Perhaps the greatest reliance, however, should be placed upon palpation of the posterior pharyngeal wall in its entirety.

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30 East 40th Street.

FALSE LUNG ABSCESS AND LIPIODOL.

DR. HARRIS P. MOSHER, Boston.

At the present moment there is great activity in the use of lipiodol for determining the nature of pathologic conditions in the lungs, especially lung abscess and bronchiectasis. So many apparent lung abscesses have been found in the cases referred from the Thoracic Service of the Massachusetts General Hospital to the Throat Department for diagnostic bronchoscopy and the injection of lipiodol that the suspicion has been growing that the shadow which so perfectly simulated an abscess in most cases was an area of "drowned lung"—that is, drowned in lipiodol.

Experiments on dogs have proved that this suspicion is correct. It has been our custom to use 40 per cent lipiodol. A bronchoscope was passed to the pathologic bronchus and then by means of a cannula inserted through the bronchoscope and into the mouth of the diseased bronchus the solution was injected.

The intact lungs of a dead dog were inflated and kept in this condition. Through a window in the side of the trachea a bronchoscope was introduced and through this the cannula for the lipiodol. A terminal bronchus of the right inferior lobe was injected. The oil was carried by gravity also to the left upper lobe. Typical pictures of lung abscesses were obtained in both places. An attempt was made to evacuate the lipiodol from one of the injected areas. Watching the attempt through the fluoroscope showed that this could not be done. Even after the main bronchus to the injected area was slit open, pressure would not clear the lung of the oil. The same experiment was tried on a living dog—minus, of course, actual pressure on the injected area, with the same result.

These experiments proved that 40 per cent lipiodol injected into the terminal bronchus of a normal lung will give the picture of a lung abscess. In order not to draw false conclusions, therefore, weaker solutions of lipiodol must be used. Experiments are now being carried on to determine what strength of lipiodol must be used in order to avoid a misleading picture. It is felt that the oil if it is to be of real service must be introduced with a nebulizer, and experiments along this line have been started.

The purpose of this preliminary notice is to call attention to the unfortunate drawback connected with the use of lipiodol, namely, that the saturation of a given area of normal lung with lipodol will give the X-ray picture of a lung abscess.

828 Beacon Street.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

Regular Meeting, Nov. 24, 1926.

Keratosis of Vocal Cord, Followed by Malignancy. Dr. David H. Jones.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. FREUDENTHAL: I recall having seen the case about a year ago, and if I am not mistaken I made the diagnosis at that time by simply looking at the case, that it was malignant. I am inclined to consider every such case as malignant. I should not be surprised if in this case stenosis would set in very soon; but I would like to know why Dr. Jones did so many biopsies—is not that an irritation in itself? I have seen about fifty cases that showed very similar conditions, and should I have opportunity I will demonstrate one of them here next time; but I think that every such case in a person over 45 years of age is a malignant growth.

DR. S. KNOPF: It is especially interesting in view of the fact that we have had opportunity to watch this patient. He has been observed practically every week, and we could see the changes going on following the radium and X-ray treatment. Of course, to all intents and purposes, this lesion looked like a leucoplakia of the mouth—that is, as on the tongue or buccal region—when he was first examined. Then we could see changes at first apparently for the better following the X-ray treatment, and later degeneration to a marked degree extending over to the left cord and subglottic region. It was certainly suggestive of malignancy, and I think it necessary to consider all these type of cases of leucoplakia or keratosis of the larynx in any individual above the age of 45 years as at least precancerous. Keratosis of the larynx is really a rare condition, and Dr. Jones should be congratulated upon having observed and studied this case so carefully for such a length of time.

DR. LORE: The question came up as to what should be done in a case of this sort; whether one should advise laryngectomy or perhaps less radical measures. One must consider that at first it was a keratosis, and that its development into an epithelioma has taken a year and a half, and even now it is not very bad. I have always thought that radical measures should not be done, and I could not blame the man very much when he refused a laryngectomy, for I would have done the same in such a case. I have not seen a clinical case with that amount of involvement without some interference with movement, and I still feel that if any operative procedure is considered it should be a double thyrotomy.

DR. JONES, in closing the discussion: I have been unable to find very much in the literature on keratosis of the cords. Logan Turner in his book states that there are only a few cases reported and I made inquires at the Surgeon-General's Library at Washington, D. C., and could find no record of any cases. My reason for performing so many biopsies was to clear up the diagnosis.

Buccoantral Fistula; Closure by Plastic Procedure. Dr. Irving W. Voorhees.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

Coagulation Time Prior to Tonsillectomy. Dr. Westley M. Hunt.

DISCUSSION.

DR. FREUDENTHAL: I had the coagulation time tested for quite some time but as I did not see any benefit from it one way or another I gave it up as unnecessary. I have learned, as we all have, to consider tonsillectomy as an important operation, and for many years I have never operated on the

tonsils in my own office. Some physicians do it, but accidents have happened. Not long ago an accident happened in a doctor's office, and I am glad to state that I helped to get him out of his trouble. It all goes to show that we have to be careful in every case, and it is extremely unpleasant, when accidents happen in the office.

When these hospitals report operating on so many cases without any deaths, we have to accept this with a grain of salt; the patients are discharged soon after operation—sometimes the next morning, sometimes after a few hours; and the trouble develops later and other hospitals see the case. I have had several such cases come under my observation in former years.

DR. HELLER: This is a most timely paper and I am glad Dr. Hunt has presented it. I hope it will go on record where it can be referred to for some time. Someone is going to be sued for bleeding after a tonsillectomy, and this question of the coagulation time will be part of the testimony, even if it has not been of much value so far. I have felt, as Dr. Hunt said, that you cannot tell anything about the bleeding by the coagulation test; where you don't expect bleeding you get it, and vice versa. The trouble does not depend on the coagulation time entirely; many factors enter into the matter and the coagulation time may be one of the simplest. The question of adhesions is important. Many patients with a history of numerous sore throats have had new vessels formed, the line of cleavage not easily found, and the tonsil does not separate as well as in uncomplicated cases. That is the biggest factor. Another thing that has not been touched upon is the blood pressure. If we took the blood pressure in adults as often as we take the coagulation time, we would learn much more. After all, the normal is purely an arbitrary thing, and true hemophiliacs are very rare. I have been practicing medicine for thirty years, and in hospitals and private practice I have met but one true hemophiliac, a child with a cut a quarter of an inch long on her forehead who bled to death. If the bleeding occurs it is not necessarily a sign that that patient is a hemophiliac or even a bleeder. Perhaps it is the technique; there may be difficulties that no one could overcome, but that does not mean that the patient is a bleeder.

As to the anemias, inadvertently I operated upon a patient with anemia some ten years ago, when these tests were very rare. This patient bled no more than the ordinary case. She ran a temperature, and we examined the blood. We found 260,000 white blood cells, and the patient died ten days later of myelogenous leuchemia. Perhaps even the anemias do not mean that they are necessarily bleeders.

In my present practice, I take the coagulation time of all children; but as to adults, what individual on getting to adult age has not had an experience if he is a true bleeder? All have had teeth pulled or some injury or operation done, and it is rare for a grown person not to have had some bleeding if he is a bleeder—if it is a woman, she will say, "I bled excessively at my confinement"—so the history is really more valuable than the time taken up in the coagulation test. In the children, we make a hemoglobin test as well. Many children suffer from a mild type of anemia—particularly the adenoid type, where they are probably somewhat undernourished. It is not unusual to find a hemoglobin of 55 per cent, and in such cases I like to wait a couple of weeks and have the parents feed them up; then I take another blood test and operate or not, according to the report. If the child cannot be built up in three or four weeks with cod liver oil or something of the kind, it is not a good risk for operation.

DR. DENNIS J. MCDONALD: I have been very much interested in the subject under discussion and the previous speakers have covered it very thoroughly. The essayist has brought us something to think about. Those of us who have been working for many years have learned that the more care we give to the patient the better for both him and the doctor. I do not agree with those who do not take the blood coagulation time now. In every case where an adenoid and tonsil operation is to be performed too much care cannot be given, whether the patient is a child, an adolescent, or an adult. We have heard what one speaker said about high blood pressure. What about a case of 74 years? What about the case where the child was sent to the Memorial Hospital with enlarged thymus and have an X-ray done for fifteen visits?

The man who would have operated on that child without this would have lost it sure.

So we go on to urinalysis: Every adult should have the urine examined quantitatively and qualitatively, etc., and still further blood examination should be done in all such cases. The more care exercised the better for all concerned.

DR. LETTWIN: I would like to supplement Dr. Hunt's statistics. At the Englewood Hospital we also had thought that the coagulation time in ordinary cases was neglible, but since Sept. 1, 1924, we have been taking the time on all clinical cases as a routine measure, with the following results in a total of 659 cases: Coagulation under 7.5 minutes, 607; coagulations, 7.5 to 14 minutes, 52. Per cent of cases over 7 minutes, 7.8 per cent. Average coagulation, 607 cases (under 7.5), 5.5 minutes. Average coagulation time, 52 cases (7.5 and over), 8.7 minutes.

Calcium lactate, grains 5 three times a day, was given as a routine procedure when the coagulation time was over 7 minutes. All but three of the cases responded to this rteatment. One case required a repeated week of calcium lactate; one case requird two weeks of calcium lactate and one week of calcionates; one case, which has had calcium lactate for two weeks and calcionates for one week, still has a coagulation time of 9 minutes, and operation is still pending.

The reason we started to do this work as a routine procedure was that though statistics had not been kept I noticed that several times during the year I had been called at night to stop bleeding; not since Sept. 1, 1924, have I been called upon for this.

DR. G. D. WOLF: I am sure we are very thankful to Dr. Hunt for giving us this information. However, it does not solve one problem, that is the bleeding that occurs after a tonsil operation from the first to the tenth day, I dare say that a man of average experience with a fair technique and good surroundings does not worry as much about the possibility of bleeding at the time of the operation than days later. We have means to control the bleeding at the time of the operation, but we do not know how to prevent later hemorrhages. When a patient starts to bleed on the fifth or sixth day, and in some instances the physician has not been informed about it for several hours after it occurred, one has good reason to be alarmed because at this stage we find that the patient has been weakened by lack of food and intake of water. With the absence of a history of unusual bleeding on any previous occasion, I feel one is justificd to operate without any coagulation tests.

I hope Dr. Hunt will extend his study as to the question of late postoperative hemorrhages. This question has not been given the attention it deserves because most of the time we are taken unaware when these hemorrhages occur.

About three years ago I operated on an adult, under local anesthesia. On the seventh day he was seen by me at my office. His throat looked apparently well, all healed, and I discharged him. That night I entered myself to the hospital to be operated upon, and I was subsequently told that this patient was taken to the hospital with a severe hemorrhage.

We are all familiar with cases that we see the same day after the operation and we find both tonsillar fossae filled up with organized clots and slight oozing behind them. Here there is apparently no trouble with the coagulation, but rather with the contractibility of the blood vessel and surrounding tissue.

In uterine hemorrhages we know that as soon as the clot is removed, in the majority of cases the uterus will contract and the bleeding cease. An analagous situation exists in the throat, apparently. Unless other factors than coagulation will be studied the problem of postoperative hemorrhages will not be solved.

DR. A. LOBELL: The problem of hemorrhage following tonsillectomy will probably never be solved for the following reasons: Firstly, the procedure of operating does not coincide with the surgical principles carried out in other parts of the body. If a similar structure had to be removed from another part of the body there would be no question of coagulation time or bleeding after operation. A tonsillectomy is in reality a peculiar operation; it is not surgical in the true sense. We remove a gland from a highly vascular area and the

wound is left wide open. During the operation most of the bleeding points cannot be located for ligation. Some blood vessels do not bleed during the operation, but will do so later on. Secondly, the anatomical conditions are unusual, because there are so many reflexes to contend with, namely, the palatopharyngeal, laryngeal, and that most powerful reflex of all, the reflex of deglutition. These play no small part in hemorrhage after tonsillectomy.

One point has not been touched upon, that is the relation between hemorrhage and operations on tonsils that have not fully recovered from acute inflammatory processes. We cannot rely on the appearance of the tonsils and surrounding areas. They may not show any traces of acute inflammation. The patients usually do not volunteer the information. They must be questioned carefully. We must go into the history minutely on this point. I have had several such cases where I could not account for the profuse postoperative bleeding and a careful history disclosed the fact that there existed a recent acute inflammatory process in the throat, either in the tonsils or surrounding structures.

DR. I. W. VOORHEES: I had a case of tardy hemorrhage which occurred on the seventh day after operation. It had not bled at all on the table, and it was not necessary to tie off any arteries, or use any styptic. Everything went along satisfactorily until the seventh day, when the child came in from play with a mouth full of blood. He was sent into the hospital and given an anesthetic and bleeding point was tied off. I don't know how you can avoid that, but I insurred the parents' ill will for not having done something to prevent it. I suppose a piece of tissue sloughed off. Dr. Kulkin, who is present, recently operated upon a hemophiliac. I think if the Chair will call upon him the relation of his experience will be highly interesting.

DR. KULKIN: The patient to whom Dr. Voorhees referred came into the Post-Graduate Hospital with a distinct history of hemophilia. He had had two teeth extracted in Berlin and had bleeding for four days. I showed him to Dr. Buckley, who said that personally he had never seen a hemophiliac and questioned whether the patient was one. He was sent to the laboratory and the coagulation time was 4.5 minutes, the bleeding time 4.5 minutes, blood platelets, 225,000 to a field, etc. According to the picture, he was not a hemophiliac, and I advised operation. I did a local tonsillectomy and about thirty seconds later he began to ooze from both sides, and continued for three hours until I was exhausted attempting to control the bleeding and told the house surgeon to do what he could; and then we called Dr. Buckley, who worked over him for four hours, and sewed up everything in sight. Then we did a transfusion and sat up all night; at 4 o'clock we did a second transfusion, and later a third and a fourth transfusion were given. The hemoglobin went down to 20. The patient got well, however, and is well today. Here was a distinct case of hemophilia, and he had so told us. The reason for doing the tonsillectomy with the above-mentioned history: Here was a carpenter who had been laid up for four months previously on account of rheumatism, undoubtedly due to his diseased tonsil, and had been advised to have a tonsillectomy, or he could never keep on with his work. The patient really owes his life to the skill and patience of Dr. Buckley, who stopped his bleeding after I failed to do so.

DR. CREIGHTON BARKER: Dr. Hunt has focused our attention upon a subject to which many of us have given considerable thought, but he has not answered the question. I have been somewhat surprised that someone has not suggested the role the physiologist should play in all this. It is fundamentally a problem in physiology rather than in surgery, and apparently we do not know the physiology. I heard one of the gentlemen say that he used calcium lactate; we all do that, and now and then seem to get some brilliant results, but I doubt very much if you could find any experienced physiologist who would support the claim that calcium lactate will hasten the coagulation of the blood.

The material that Dr. Hunt presented is but a single phase, that is, the experiences of a large number of observers and is of course of value; but the fact that there is a great discrepancy of opinion throughout the country seems to prove to my mind that we are quite uncertain of our ground, and are not quite sure what we are talking about. One thing the physiologists

have pointed out to me recently is that the coagulation time of blood drawn from the vessels is almost invariably longer than blood drawn from a puncture in the ear or finger tip; the reason, I am told, is the addition to the blood of some tissue juices. The situation that exists in tonsillectomy is that possibly after some bleeding has taken place these tissue juices are exhausted or washed off by the saliva or squeezed out by the compression of the snare or other instrument. I would like to leave that thought with you, but the subject should not be abandoned without further very careful investigation. There is some answer to it; so far, I think we are wrong.

In regard to what one of the speakers has just said concerning hemophiliacs, it is possible, I have been told, to make a definite diagnosis of hemophilia by computing what the physiologist calls the prothrombin time. It can be done in a few minutes, without any special apparatus. I have tried it in about 100 cases. I am not quite ready to say just what its value is in connection with tonsillectomy, but it does seem that it gives a little more aid than the coagulation time.

DR. H. M. SCHEER: It seems that both the writer of the paper and the discussion have brought up just casually a few remarks about the examination of the cytology of the blood. To my mind, this type of examination—the cytology of the blood—as well as the tourniquet test around the arm, is more important than the coagulation time itself, as was brought out in the paper. Practically, we were led to believe that many men have been doing it purely because it gives them a sense of safety, and not because it will be of any real help prior to the operation or just after.

The point of taking the history carefully is very important. We should do a physical examination in these suspected cases. I recall an instance in which the physical examination of blood dycrosis led me to believe that the case might cause trouble at the time of operation. The examination, though it was a superficial one, showed purpuric spots on the body, which led me to suspect a blood condition. I not only had the blood coagulation done—which, incidentally, was normal—but had all the other blood tests made—cytology, hemoglobin and tourniquet test, etc. The tourniquet test in conjunction with the cytology of the blood will in blood diseases almost invariably bring to the attention of the surgeon whether or not he is safe in operatin. Purpura will always show some kind of blood changes. In the two cases of sad experiences which have been cited tonight, if a complete analysis of the blood and other associated tests had been made prior to operation both men would have been happier, and probably would have avoided operation on the patients. It is better to have a live patient with tonsils that may cause a rheumatic attack at some time than a dead patient because of omission of some precautionary tests and examination prior to operation.

DR. GUTTMAN: I would like to know the indications for operation on the man age 76 years, who had a tonsillectomy performed.

DR. VOISLAWSKY: I am very glad to have been here tonight and to have heard Dr. Hunt's most valuable paper. It shows a great amount of work and the statistics he has gathered are of more importance than you would get in the ordinary or casual paper. I instituted the practice of the coagulation test at St. Luke's Hospital some ten years ago and we have kept it up faithfully ever since. It is a very valuable thing from many points of view. It may be that Dr. Hunt's paper will be used a great deal more in court cases than by ourselves.

I was very much amused when I heard of the doctor who had a hemophiliac and operated on him, knowing full well that if he got the patient well it would be a great triumph for him, yet in my recollection the one time I tried to do a coagulation test on a hemophiliac, they took me to court for a number of days, but fortunately the verdict was in my favor. I make you a suggestion: If you have a case bordering on hemophilia, have that patient's blood grouped, and give him a transfusion before the operation—in fact, I would have my donors in the hospital, ready to do another transfusion when the operation is completed. I had such an experience this spring with a patient age 75 years, where it was absolutely essential to do a tonsillectomy. We transfused him and he is well today.

DR. KNOPF: Although the paper of the evening was on coagulation time prior to tonsillectomy, I am sure the thought behind was the postoperative hemorrhage. Aside from hemophilia, there are other points which might be considered. The questions brought up tonight by Dr. Freudenthal and Dr. Wolf were essentially important: Why should bleeding occur, four, five, six or seven days following a tonsillectomy? I have had the opportunity of watching many varieties of operations on tonsils by many men, and I think that the technique particularly may frequently be the fault. When one sees a man take a tonsil sponge and roughly manipulate it into the fossa following the enucleation of the tonsil—whether by a Sluder dissection or any other method—one should consider the reasonable possibility of a postoperative hemorrhage; the trauma is sufficiently great to cause a postoperative sloughing which might easily become infected by the bacteria in the throat that the exudate eventually becomes so thick that when it begins to peel off there is a great deal of postoperative hemorrhage four to six days later. Another cause of postoperative hemorrhage is the indiscriminate use of clamps. If one sees the procedure of clamping off wherever a vessel happens to be bleeding—where a large piece of tissue is clamped and held tightly for three or four minutes, instead of grasping the bleeding point—why could not a slough occur large enough to produce postoperative hemorrhage four to six days later? Another reason: If a man ties off a vessel and instead of taking the small point of bleeding and tieing off just that point, he ties off a large area tightly, why could not that also cause a postoperative bleeding four to six days later? These points should be considered seriously, and therefore I repeat that the technique should be particularly observed. Aside from the question of hemophiliacs, my opinion is that these facts are especially reasonable causes of postoperative hemorrhage.

DR. G. D. WOLF: Dr. Knopf's remarks would imply that postoperative hemorrhages are necessarily due to improper technique. As a matter of fact this is not altogether correct.

Five years ago I visited the Mayo Clinic, where I stayed for about three weeks watching their technique. In spite of the fact that in all other surgical departments the technique is standardized, this does not hold true for tonsil and adenoid operations. Of the three or four men I watched operating, a different technique was employed by each operator. There is one thing, however, that impressed me; first, that no suction anesthesia apparatus was employed during the operation; and, second, that no effort was made to stop the bleeding after an operation under general anesthesia, but the child was turned downward into the basin until bleeding stopped. Since that time, I have made it a practice to use as few sponges or clamps as possible, but suck away the blood from the pharynx and wait until the hemorrhage stops of its own accord. By far, in the majority of cases nature stops the hemorrhage by itself without any assistance. In spite of that I still get postoperative hemorrhages.

It has been my observation that when the patient bleeds very little on the table, that one may look for some trouble later. And, finally, when we consider the fact that most of the tonsil and adenoid operations are done by inexperienced house surgeons in hospitals without any particular disastrous results, one cannot blame everything on technique.

DR. JOSEPH BRUDER: Everyone has been discussing the problem of hemorrhage following tonsil operations, but my greatest problem was the hemorrhage following intranasal operations.

Up to four or five years ago, it was a common occurrence to be called to the home of the patient to arrest a hemorrhage following an intranasal operation.

In my tonsil operations most of the bleeding occurred in adults.

During my twenty-two years of practice in this specialty, I haven't had more than five hemorrhages following tonsil operations in children. In adults, on the other hand, I was not so fortunate.

I am frank to confess, however, that since I improved my technique hemorrhages following tonsil operations on adults are almost *nil*.

My last hemorrhage case dates back to two years, and even in that case I found a piece of tonsil hanging in the fossa.

Up to four or five years ago, I adhered to the rule not to pack a nose following an operation, and up to then hemorrhages following such an intranasal operation were not uncommon.

Now I leave packing in the nose for three or four days, and, in some cases, where the patient shows signs of bleeding when an attempt is made to remove the packing, I allow the packing to remain even for a week, without the patient showing any ill effect.

Thus I have eliminated that source of trouble entirely.

I would therefore ask the essayist to be good enough to tell me whether in his experience, hemorrhages following intranasal operations are not more frequent than hemorrhages following tonsil operations?

SECTION ON OTOLOGY.

Regular Meeting, Dec. 10, 1926.

Case of Diabetes Mellitus, Acute Coalescent Mastoiditis Left, Perisinus Abscess, A-symtomatic, A-bacterial, and Obliterating Thrombophlebitis of Sigmoid Sinus. Dr. Mark J. Gottlieb.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. KOPETZKY: I doubt if there is anything to add. The case simply calls to mind a fact which I have often stressed here on numerous occasions—that when we are dealing with infection superimposed on constitutional conditions like diabetes, etc., the ordinary clinical reactions are not to be expected. In this case a constitutional factor was presented which was a screen and which clouded the picture so that a proper estimation could not always be made as to what the lesion was doing.

Suppurative Labyrinthitis; Serous Meningitis. Recovery. Dr. Richard Travis Atkins.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. MAYBAUM: What were the indications for operation and how soon after the onset were the labyrinthine symptoms evident?

DR. ATKINS: An inactive labyrinth in the presence of a meningitis. The labyrinth became inactive about twelve days after the onset of the symptoms. The cell count was 58,600.

Traumatic Mastoiditis with Postoperative Signs Suggestive of an Intracranial Complication. Dr. Walter L. Horn.

DISCUSSION.

DR. FRIESNER: Those of you who attended a recent meeting of the Otological Section, at which Dr. Dandy reported his method of surgical treatment of brain abscess, heard me report a similar case in a child as one of my early experiences. The youngster was about 10 years of age and had a left mastoid, and had been operated upon six weeks before I saw it, and he then had all the typical classical focal signs of a left temporal lesion. The neurologist at Mount Sinai urged me not to explore the case until he had had opportunity to observe it a little longer; he said he had seen cases exactly like it in the early days of the mastoid operation, and had seen them get well. To my mind, the child had every indication to warrant operation, but, urged by Dr. Sachs, I desisted, and to my surprise the child recovered. The child also had a bilateral choked disc.

I would like to say a word in regard to Dr. Atkins' case. Those of us who have had considerable experience with a diffuse suppurative labyrinthitis have rarely found the hearing continue for more than twenty-four hours after the labyrinthine symptoms developed. That, to my mind, is the outstanding fea-

ture of Dr. Atkins' case. Usually an acute diffuse suppurative labyrinth goes on to total deafness within twenty-four hours, and for the hearing in his case to remain for two weeks was well worth remembering.

DR. ALFRED KAHN: Discussing the case of traumatic mastoiditis brings to mind a case which I operated on in Dr. Dench's service at the New York Eye and Ear Infirmary—a recent fracture of the mastoid bone running through the facial ridge; associated with a facial paralysis, discharging ear and tender mastoid. When the mastoid bone was opened a most unusual appearance presented itself. After the cortex of the bone was removed a very cellular bone having a black-brown bruised appearance, without any free pus, was thoroughly curetted. The bone looked as though it was ready to break down within a few hours. The fracture was plainly seen running through the facial ridge. Nothing more than a simple mastoid operation was done. When I last saw this patient, several weeks after the operation, he was almost entirely healed and the facial paralysis had practically cleared.

It would seem to me that in cases of acute fracture of the mastoid where brain involvement is suspected that as a rule it would be inadvisable to do anything more than a simple mastoid operation. Time would be too short for the formation of a brain abscess; and if meningitis developed it would not be likely to be of the purulent variety. In any operation following fracture of the mastoid bone, I would not go further than a simple mastoid operation or, at furthest, a radical mastoid operation with exposure of the dura, but no further.

DR. MAYBAUM: One may well ask why Dr. Horn's case of traumatic mastoiditis with signs simulating a brain abscess was not operated on, in view of the fact that the signs of abscess were very definite. I felt more than reasonably sure that we were dealing with a right temporosphenoidal abscess still in a very early stage. Because of the latter fact, I did not consider it opportune to explore. The experience of most otologists is that it is not advisable to operate on these cases at too early a stage—before softening and encapsulation has taken place. The neurologists at first differed as to the cause of the condition, one inclining to diagnosis of brain abscess and the other suspecting a basilar meningitis. In view of the fact that the signs later became bilateral, those on the left side still remaining more pronounced, and the general condition continuing to improve, we felt that surgical interference was not indicated. The complete recovery was a gratifying and fortunate outcome.

DR. HELLER: Did Dr. Horn use a mallet and chisel?

DR. HORN: Yes.

DR. HELLER: Within a week we have had two fracture cases in the hospital complicated by acute mastoids, neither one of which had had ear trouble before. There was a bloody discharge from the ear, which became purulent, and the patients ran a temperature, one of 103° and the other of 104.° One of the men had worked for nearly a week after his accident before he came to the hospital; the other was injured in some sort of drunken brawl; but I was afraid to start with a hammer and chisel, and I was glad that I did not. Fracture began in the region of the torcular, came down and disappeared at the meatus; and extended down the canal as far as we could see, probably down to the aditus. I feel sure that if I had started out with a hammer and chisel instead of a drill I would have had a facial paralysis. The second case was a stellate fracture, starting behind the auditory meatus, radiating in all directions. Fortunately bone was soft and I was able to start and finish up with a curette. I would like to ask whether it is safe to start with a hammer and chisel following a fracture complicated with a mastoid. It is conceivable that hammering might extend the fracture through the Fallopian canal and cause a facial palsy.

DR. ALFRED BRAUN: If a fracture of that sort involves the facial canal, there would be a facial paralysis, before you operated on it.

DR. FRIESNER: I have operated on a number of these cases with a mallet and chisel and have not been conscious of increasing the fracture. As to the question of extending a fracture that has already existed, etc., I question very much whether removing the cortex with a mallet you could increase the fracture so that it would extend to the Fallopian aqueduct.

Otitic Meningitis Running an Unusually Prolonged Course. Dr. S. Rosen.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. KOPETZKY: I remember the case very well. It was not operated on while in the Beth Israel Hospital, for the reason that it did not then present anything of significance from the otological standpoint. The patient was discharged from the hospital because of generally negative findings, and presented symptoms at the Mt. Sinai Hospital after a while, as outlined in Dr. Rosen's report. The case was probably in the prodromal stage while under our observation.

Labyrinth Findings in Two Cases of Posterior Fossa Tumors. Dr. Ralph Almour.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

Jugular Bulb Thrombosis, Multiple Abscesses. Recovery. Dr. Floyd C. McDaniel.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

Procedure Suggested for the Diagnosis of Sinus Thrombosis. Dr. Reuben Ottenburg.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

Two Acute Cases of Cavernous Sinus Thrombosis Associated with (1) Acute Purulent Otitis Media; (2) Mastoiditis. Dr. Wesley C. Bowers.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. KOPETZKY: It is a delight to hear Dr. Druss' clear, straightforward and concise chronological report. It is a proper introduction to Dr. Ottenberg's proposition. Dr. Ottenberg kindly quoted from some work of mine, and at this time I would summarize the reasons why I take the stand that the procedure advocated by Dr. Ottenberg cannot have a very definite, reliable, diagnostic value. Returning for the moment to the pathology of sinus thrombosis, one must remember that a thrombus grows in the sinus with and against the blood stream. Sometimes it is attached only to the wall, and sometimes it obliterates the lumen of the vein. The entire thrombus is not necessarily infected in the beginning. At some point within the thrombus the infection is walled off by the thrombotic material thrown up by nature to encircle it.

Later the infection spreads throughout the stroma of fibrin deposited to form the thrombus, and the thrombus becomes infected. Some of the infected material gets into the blood stream and sometimes fragments of the thrombus itself are detached and carried to distant parts. When one has a mural thrombus, the blood, of course, plays over it in passing and carries infection into the blood stream much more readily than when one has an obliterating type of thrombus. All this is very obvious.

Now if one takes cultures at various times during the development of these different types of thrombi, one gets varying results; and it is possible, by cultures taken at different times, to plot out the time factor; *i. e.*, the time from the inception of the thrombus to its organization or breaking down. It is a physical impossibility to estimate the duration of the period of the formation of the thrombus in the vein in a given case of septic sinus thrombosis accompanying a mastoiditis. Therefore the findings from the two sides, when compared to each other, cannot give definite diagnostic data; and the very fact that Dr. Ottenberg found variables in his observations from the right and the left side in a proven case substantiates my argument. Pursuing the reasoning further, in one of these cases, where the thrombus, as diagnosed by ordinary methods, would be considered to be located on the right side, if the greater number of colonies were found on the opposite side one would be justified in ligating the left jugular vein, which, of course, no one has ever proposed or would do. If one could eliminate the time factor and had a knowledge of what specific stage in the development of the thrombus gives many or few

bacteria in the blood stream, one would be in a better position to estimate the findings in a case of bilateral mastoiditis by taking equal cultures of blood from both sides and comparing the findings, because then specific information would be available that with a given blood finding a thrombus of a certain duration was present. This, of course, is not possible in the present stage of our knowledge.

I hope, however, that Dr. Ottenberg will continue his observations. Perhaps with more study we will be able to plot out the course of the bacteremia with definite stages of the thrombus. There is one other factor that is lost sight of in all our discussions, and I should like to call attention to it. It is possible to have a bilateral mastoiditis, so why should it not be possible to have a bilateral sinus thrombosis, too?

DR. ALFRED BRAUN: Dr. Ottenberg's work is very interesting and should certainly be encouraged, for any additional information that we can get on this subject is very desirable. We frequently have cases in which we are hard put to it, to reach a diagnosis, and every additional diagnostic aid is welcome. It is particularly important in a case of bilateral otitis to have some guide which will indicate which sinus is involved.

Of course, too few cases have been tested by this method as yet, to be able to say whether any definite information will be obtained in this way. The original work by Leutert consisted in comparing blood obtained from the sinus with blood obtained from the arm-vein. The trouble with this method was that it was impossible to exclude the possibility of accidental contamination, in drawing blood from the sinus, because the outer surface of the sinus wall is always infected in these cases. In drawing blood from the jugular vein this source of error does not creep in. It would seem that one would be apt to get the greatest differences in the number of colonies on the two sides, in cases where the thrombosis is situated in the bulb, rather than where it is higher up in the sigmoid sinus; for in the latter case, the stream of blood from the inferior petrosal sinus would wash past the lower end of the clot and you would be likely to get as many colonies as on the opposite side.

Dr. Bowers' two cases were very interesting, and I want to confirm several points that he made; first, the frequency of negative blood cultures. I have seen ten or twelve cases of cavernous sinus thrombosis, and they all had negative blood cultures. There was absence of choked disc or optic nueritis in most of the cases. Dr. Bowers spoke of several reports of cases of spontaneous recovery. I wish to add another case to this list. Until I saw this case, I thought that every case of cavernous sinus thrombosis was necessarily fatal. Last winter I was called to see a woman, age 40 years, with a bilateral middle ear suppuration, and mild mastoid symptoms. The day before I saw her she had the typical signs of a cavernous sinus thrombosis; exophthalmos, chemosis of the conjunctiva, swelling of the lids, ptosis and paralysis of the external rectus muscle. There was no frontal sinus disease, and there was no limitation of movement of the eyeball inward or upward, as we would expect if the eye condition were due to frontal sinus disease. Her general condition was not very bad. She was rational, and did not look very sick, and her temperature did not go above 103° F. I advised against operative interference, and to my surprise she got well.

I had another case of cavernous sinus thrombosis which showed a rather interesting etiology. A boy of 8 or 9 years had a chronic middle ear suppuration, with a facial paralysis and a dead labyrinth. I did a radical mastoid operation, and found a necrotic labyrinth, filled with pus. The following day he began to develop signs of cavernous sinus thrombosis. I made a diagnosis of thrombosis in the internal auditory vein extending to the inferior petrosal sinus, and then forward to the cavernous sinus. The patient died, and we got a post-mortem, and found just what we expected, an extension from the internal auditory vein through the inferior petrosal to the cavernous sinus.

DR. GOTTLIEB: I would like to know whether Dr. Druss tried the manometric method while the lumbar puncture was being performed. I would also like to emphasize what Dr. Kopetzky said, in a different way. In cases of diabetes, where we do not get a positive culture and yet find on operation that there was a definite disease of the vein—an obliterating process going on—that it would be entirely impossible by Dr. Ottenberg's method to determine

whether there was such a process developing in that vein. In diabetes, particularly, it is important to determine early whether or not the process exists, for that is the only way to save the patient's life.

DR. GUTTMAN: In a discussion of bacteremia in sinus thrombosis the name of Dr. Libman should have been mentioned, although it is true that Dr. Leutert was the first to advocate a comparison of the blood of the sinus with that of the arm of the same patient.

Dr. Ottenberg's finding in the second case would suggest that an affection of the sinus should be suspected on the side where the number of bacteria is smaller (17).

A comparison of the relation existing between the number of bacteria found in the jugular and arm vein of one side as compared with that of the other side may prove more satisfactory.

In regard to Dr. Bowers' case of cavernous sinus, the most important statements were: first, that a conservative treatment was the most advisable; and, second, that in the majority of cases the sigmoid sinus was not affected, The reason of the latter finding may be explained by the fact that the infected blood from the cavernous sinus was conducted to the jugular bulb by the inferior petrosal vein which does not come in contact at all with the sigmoid sinus.

DR. OTTENBERG: I cannot attempt to answer the questions in detail. I hope that I succeeded in making it clear that I make no present claim as to the diagnostic value of the method. It is probable, as Dr. Kopetzky pointed out, that he method may ultimately be of diagnostic value when the results are studied with relation to the time of the process and the stage of the case. It must be remembered that we have a moving, progressive situation in which there are a number of balanced factors. At the beginning probably all thrombi are parietal and any bacteria given off would probably go in the direction of the blood stream. When an occlusive thrombus forms it spreads up and down the vein and bacteria can only be given off into the blood at its two ends. How many bacteria will get into the blood stream will depend not only on the rate at which the bacteria are growing at the two ends but also on the character of the circulation at each end. The second and perhaps most important factor, beside the rate of growth of the bacteria, is the extent and speed of the bactericidal power of the blood. It is generally agreed that in the majority of cases that bacteria do not multiply in the blood stream but are killed off in it more or less rapidly. It is evident that if bacteria were being fed into the blood stream in large numbers and at the same time being killed off quite rapidly by the blood. one would be very likely to find the number of bacteria near the source of supply very large in proportion to the number at a distance. On the other hand if the bactericidal action of the blood were slow or if the bacteria were being fed into the blood stream slowly one would not expect to find much difference.

The suggestion to also do a culture from an arm vein at the same time is a good one. As a matter of fact, Leutert (1907) in the case in which he took a culture from the internal jugular vein at operation did exactly this, comparing the number of bacteria found in the internal jugular vein so exposed with the number in the periphery. In this instance Leutert after exposing the vein and taking the culture, waited for twenty-four hours to get the result of the culture before tieing off the vein. It is curious that this procedure seems to have received very little attention, the only reference that I can find to its repetition being by Herzog, 1911, who like Leutert found a very large number of bacteria in the jugular vein and only a few in the peripheral vein. Indeed, the procedure is only referred to by very few writers on the subject (Libman and Kopetzky). It should be clear, of course, that this procedure has nothing in common with the ordinary practice of inserting a needle into the exposed sinus and making a culture of the material obtained. The unreliability of this procedure has been pointed out by a number of observers and it is not necessary for me to discuss it.

DR. DRUSS: We did not do a Queckenstedt test.

Case of Primary Jugular Bulb Thrombosis Presenting Certain Unusual Features. Dr. Joseph G. Druss.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

KANSAS CITY EYE, EAR, NOSE AND THROAT SOCIETY.

Meeting of Nov. 18, 1926.

SYMPOSIUM ON HEADACHES.

Headaches Due to the Eye. Dr. W. G. Gillett.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

The Nasal Aspect of Headaches. Dr. James C. Braswell.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

Headaches of Intracranial Origin. Dr. Frank R. Teachenor.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. DORSEY: I wish to speak of two kinds of headache frequently seen by the oculist which have not been mentioned tonight. The pupils having the idea that these headaches are due to some eye trouble. The first is the headache in the top of the had. It is very seldom that such a headache is due to eye strain. The second type which frequently comes to the oculist is that due to a supraorbital neuralgia. Due to the tenderness over the supraorbital notch the patient thinks it is associated with some eye condition. This form of neuralgia I have found is usually relieved by large doses of quinin, as much as 40 grains per day.

DR. TURMAN: There is one type of headache in children which I have found many times following tonsillectomies. Soon after the operation the parents will tell of a sick headache which the child is having. These headaches will persist until the child is refracted and proper glasses prescribed.

DR. LEMOINE: There is frequently more than one cause for the headache complained of by the patient. Maybe the headache is relieved partially by refraction and then the patient should be gone over, looking for other factors.

DR. FOSTER: When I first started in practice many turbinectomies were being done to relieve pressure headaches. Men doing general practice as well as rhinologists were taking out turbinates. I soon found this to be poor surgery. The patient seldom got relief. I now do a submucous resection for nasal obstruction and its accompanying headache with much better results.

DR. MYERS: I believe that in trying to find the etiology of a headache one should make a more thorough study of the fifth nerve. Its sympathetic relations are especially important in working out the causes of some of the most obscure cases.

DR. THOMASON: In making a summary and drawing conclusions of one hundred cases on which a submucous resection had been done at St. Mary's Hospital, I found that in giving their symptoms, that is, what brought them to the hospital, that nasal obstruction ranked first and headache second. Six months after date of discharge the sister in charge of the record room, in her follow-up report, found that 95 per cent had been relieved of the obstruction, and 80 per cent relieved of their headache. Most of these headaches are due to pressure. As a method of diagnosis in the office I cocainize the middle turbinate and if headache is relieved then consider that I am justified in doing a submucous resection.

DR. KIMBERLIN: I have my own routine as to history. I think that the history is of prime importance. If a case comes in the office with history of headache for only a few days I do not do a refraction, but have them wait a week or two to see whether it is persistent. The onset of the headache is very important. If awakened with, it is not an eye strain affair.

DR. LANING: In answering Dr. Cook as to what is a vacuum headache, I would say that the patient comes in complaining of headache starting in the morning, about two hours after rising, which gradually passes away in the afternoon. One finds tenderness and pain in the supraorbital region, no pus in the nose, a congested mucous membrane and nasal obstruction. In particular, a blocking of the nasal frontal duct. Relieved temporarily by shrinking with cocain, and permanently by removal of mechanical obstruction.

THE PHILADELPHIA LARYNGOLOGICAL SOCIETY.

Meeting of Nov. 2, 1926.

COLLEGE OF PHYSICIANS.

A Plea for Conservation in the Treatment of Optic Nerve Disturbances from Focal Infection. Dr. Leon E. White.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. H. MAXWELL LANGDON: In Dr. Maxwell's discussion of Dr. White's paper he mentioned that the ophthalmologist was not limited to affections of the optic nerve, the result of foci of infection. He also had to deal with keratitis, iridocyclitis and inflammation of the uveal tract. He spoke of a possibility of general diseases, such as syphilis and tuberculosis, that might also be responsible for these conditions. In fact, the Germans are of the opinion that 85 per cent of the afore-mentioned are really tubercular and treat these cases accordingly, without making much search for focal infection.

He mentioned that retrobulbar neuritis means inflammation of the papillo-macular bundle, and he emphasized that this bundle was the most sensitive portion of the nerve. He stressed the fact that the ophthalmologist had to deal with a number of other conditions which might cause retrobulbar neuritis; for example, tobacco, alchol, various nerve affections, as multiple sclerosis, diabetes, etc. He said that the Gradenigo syndrome, with its sixth nerve paralysis, was an example of a focus of infection producing conditions extra-ocular in character. Other foci of infection could be attributed to diseases of appendix, gall bladder, Fallopian tube and prostate. He said that he was radical only when the occasion warranted it, and that the part suspected should usually have convicting evidence against it before anything should be done, but this could not always be so. He remembered a case that he had seen together with Dr. Ross Hall Skillern, which had also been seen by other laryngologists, in which the sinuses were negative. Wassermann was negative and there was no tubercular involvement. The tonsils appeared infected and they were taken out, but the eye got worse, until it resembled a dead fish's eye. The cornea was gray, almost opaque, the vision was cut down to light perception. Because of the engorgement and the pain it was thought that removal might be necessary. However, when Dr. Skillern opened the sphenoid and a thin mucus discharge, tinged with blood, appeared, improvement was immediately noticed and complete recovery with normal vision resulted. This particular case made a great impression on Dr. Langdon and he stated that in the future he would not wait in serious eye conditions even if there was no apparent pathology of the sphenoid but would urge opening it. He thought it was of great diagnostic importance to find the septum jammed against the middle turbinate.

Dr. Langdon was very skeptical about spontaneous recoveries. He thought it was entirely too questionable to be relied upon sufficiently and he reiterated that none of his patients would have a chance to experience it if he could help it.

DR. EARLE C. RICE: The subject of focal infection from the dental standpoint needs cary us into the field of what we find after the extraction of the offending tooth. We hear reports made by Roentgenologists as follows: First, superior bicuspid on the right side abscessed. That is entirely wrong, since an abscess cannot be diagnosed by looking at the plate alone.

The Roentgenogram is merely a record of the relative densities of tissue. The patient's mouth should be examined to give an intelligent report. I believe in absolute radicalism in the removal of focal infection from a dental standpoint. I do not believe that a nonvital tooth should remain in the mouth

and all teeth showing devitalization should be removed. The socket from which the tooth has been removed should be thoroughly inspected and medicated. We should not wait for the onset of myocarditis or other diseases, but remove the tooth. Several months ago a patient appeared in my office, blind in his left eye. He had in his lower left mandible a root of a tooth imbedded and this root was left by an extractor twenty-nine years before I removed it. I extracted the root and in three months the man could read with his left eye. The thing that should not be done under any circumstances is that a man say, "This is the worst tooth, extract it and see what happens." We are eliminating only one of the mills that are constantly contributing infection to the blood stream. When the dental pulp has been removed from a tooth, the pulp in its entirety has not been taken away, but only the central core. The protoplasmic prolongations that extend throughout its entire dentine still remain. We should not wait for disease to come down when we know we have the elements within us to produce those diseases.

Nonvital teeth are just as dangerous when they do not show areas of rarefaction about the root apices. I want to lay emphasis on this radical statement, which I will stand back of, that is, that no nonvital tooth should remain in the mouth. Neither should teeth approaching devitalization remain.

Dr. Ross Hall Skillern said that no one had followed Dr. White's writings and teachings with more interest than he had since the late war, but that he was going to speak from the rhinological point of view and from personal observation alone.

When the ophthalmologist saw a case of retrobulbar neuritis and referred the patient to a rhinologist for an opinion, if no pus was seen coming down the posterior pharyngeal wall or no redness or other evidences of pharyngitis, it was considered that the sphenoid was perfectly normal. Such, however, is not the case. When pus is present Dr. Skillern felt that the sinus was beginning to take care of the infective organism. A swelling of the posterior extremity of the middle turbinate sufficient to block the sphenoid region is of far more significance to him than the presence of purulent discharge. He emphasized that he wanted to see the contents of the sphenoid and wanted to know what was on the inside of that sinus. He said that be believed the sphenoid sinus is more responsible in the causation of retrobulbar neuritis than any other factor. The posterior ethmoidal cells alone, in his opinion, played an unimportant role. Regarding the surgical aspect, he believed that an attempt should be made to preserve the middle turbinate and the ethmoids if possible, but where it was absolutely necessary to perform further operative procedures one should not hesitate. He recalled only two instances where it was necessary to do this.

Dr. Skillern stated that were he ever to get a retrobulbar neuritis he would go to the ophthalmologist and if there was a report that his vision was rapidly decreasing he would immediately have the anterior wall of the sphenoid removed and then look for other probable foci of infection afterward. The examination of the blood, urine, question of alcohol, tobacco, etc., could also be looked into later.

Dr. George W. Mackenzie: I have listened to the symposium with a great deal of pleasure and profit. There are several things that might have been included with the other valuable data the essayists presented had the time permitted and for that reason I have no hesitancy in referring to them in the discussion.

It may be recalled that sphenoidal sinusitis does not always produce the same type of inflammation of the optic nerve. For instance, in one case the inflammation of the optic nerve is due to the contiguity of the nerve to the upper sinus wall; in which case the bacterial toxins seeping through the wall produce an inflammation of the nerve only in that portion which is contiguous to the sinus wall, while the rest of the nerve may be quite free of inflammation. In another case, the sinus inflammation may produce bacterial toxins which find their way into the lymph stream and thence into the blood stream and by reason of the elective affinity for the optic nerve, produces transverse neuritis comparable with the neuritis of any nerve of focal infection origin. Furthermore, inflammation of the posterior group of sinuses may cause either a moderate or severe grade of orbital cellulitis, in which case the optic

nerve, along with the other structures of the orbit become involved. In this latter case naturally there are other evidences of the inflammation of the orbital tissues. To-wit: slight proptosis, redness of the conjunctival tissue, soreness of the eyeball on attempts at motion, particularly inward, and limitation of motion.

When we first meet a case of optic neuritis, as soon as the diagnosis of the location of the lesion is made, the next thing to do is to determine its etiology, the causes of which may be divided into four groups:

1. Those due to the acute infectious fevers, such as influenza, measles, etc.
2. The chronic infectious fevers—those producing granulomatous type of infiltration, such as syphilis, tuberculosis and leukemia.
3. The exogenous—lead, arsenic, mercury, alcohol (ethyl and methyl), tobacco, quinin, salicylates and a long list of others.
4. The so-called idiopathic—rheumatoid, gouty, refrigeratory; conditions which daily we recognize as of focal infection origin.

It may be recalled that several of the essayists referred to this fourth type and Dr. Langdon credited it with causing as many cases of neuritis as syphilis. May I go even farther and suggest that it probably accounts for a much larger number of cases than syphilis? May I emphasize the fact pointed out by others that in the case of focal infection the involvement tends to be unilateral, whereas in syphilis it tends to be bilateral? In the cases of focal infection origin there is a typical blood picture, in that there is an increase of the total white corpuscle count running from 9,000 to 16,000, with the relative increase in the proportion of small lymphocytes, ranging from 32 to 40 per cent and even higher.

In the study of neuritis of focal infection origin, let us say from a tooth, our plan has been to confirm our suspicions by X-ray examination first and then have a blood count made. If the count resembles that to which I have just referred, we feel as though our suspicions were somewhat confirmed, but not entirely. The patient is then taken to the exodontist and the bacterial flora about the mouth and neck of the tooth is cultured as a control before the tooth is extracted. Next, a freshly sterilized aural speculum is introduced into the alveolus and the first curettment is made through the speculum, which protects the alveolus from surrounding contamination. If the culture made from the curettment is different from the control culture, we are lead to believe that it belongs to the alveolus, pure and simple. Furthermore, if, with the thorough surgical elimination of infectious matter from the alveolus, there is a rapid improvement of the patient clinically, together with an improvement of the blood count to normal, we are forced to believe that the infection in the alveolus was responsible for the secondary lesion and the blood picture characteristic of focal infection, changes to the normal.

Dr. Robert John Hunter: How quickly may the improvement be seen? I have seen one case of retrobulbar neuritis in which improvement following the operation on the sinuses was very marked in seven-and-one-half hours. We did not examine the patient before that time and in the light of a subsequent experience I have been wondering how soon that patient might have improved. Since then I had a second case and I must confess that I am in doubt as to the accuracy of these findings. A patient was referred with retrobulbar neuritis. The tonsils were so infected that I thought we should remove those and watch the result. I performed a local tonsillectomy with rather less bleeding than usual and immediately the patient said he could see better. He was a stable sort of individual, apparently not neurotic. I should like to ask Dr. White if he has had a similar experience. I have heard of cases in which cocainization of the turbinates caused improvement. One point Dr. White spoke of, that is very important, is that in sinusitis it is possible for a thickened mucous membrane to cause serious trouble in the nerve. I think those are the cases in which X-rays would be negative. It would be very difficult to discover a mild thickening of the mucous membrane in the depth of the sinus. I enjoyed the paper immensely and I think Dr. White might change the title of his paper to "A Rational Treatment of the Sinuses."

Dr. Henry S. Wieder asked whether in Dr. Rice's opinion apical resection was sufficient to eliminate focal infection in an offending tooth.

DR. RICE: Apical resection is not a success, because if the root canal is infected at all it is infected throughout its entire length. It is impossible to test the tooth without extracting it to find out if the operation has been a success.

DR. WHITE: I think it is extremely important to speak of the other etiological factors of retrobulbar neuritis, those coming from alcohol, tobacco, etc.

Dr. Rice's point on the extraction of every tooth that is not a live tooth is very important. It is a little more radical than the man I send my cases to is willing to admit. I have had patients with deafness in which I suspected that some focus of infection was present, yet I could not get any support that well-filled teeth were responsible.

In reply to Dr. Skillern's remark, I would say that there was a time when I opened up all the sphenoids but I do it rarely now since, as I said before, that the tonsil was the most frequent offender, then the teeth, and the sphenoids last.

Dr. Mackenzie's point on increase of leucocytosis was well taken. If you have a diminution in your leucocytes within a short time following the elimination of a suspicious focus the diagnosis is practically confirmed.

In reply to Dr. Hunter, I have heard of a case of improved vision directly after operation. In one instance I had a patient who was completely blind and twenty-four hours after removal of the tonsils vision became normal.

DR. GEORGE M. COATES: I think the Society has been very much honored in having Dr. White and the other speakers come down tonight and I propose a movement of thanks.

Meeting of Dec. 7, 1296.

COLLEGE OF PHYSICIANS.

Symposium on Cleft Palate. Dr. John E. MacKenty (by invitation).

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

Plastic Surgery of the Nose (with lantern slides). Dr. Robert H. Ivy (by invitation).

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. GEORGE M. DORRANCE: In all presentations on the subject of cleft palate, the author discusses in detail the technical problems involved in acquiring a perfect anatomical result and little or no mention is made of the functional results obtained.

I am much more concerned, and so is the patient, with obtaining a good speaking voice. With this object in view, I have had to change many of the ideas I previously held on the time to operate and have devoted considerable thought to the after-treatment of each individual type of case.

You will note that Dr. Brophy always advises early operation. This is based on the theory that repair should be done before the child learns to speak —a good reason, providing the type of operation will permit the muscles to shut off the nose from the pharynx, and if the mortality is not increased by early operation.

Collected statistics show a high mortality in the very young, and it is generally conceded that more failures are likely to occur in operations before the fourth year.

It is of course impossible to make hard and fast rules as to the time to operate and the type of operation to use for all cases. Each case is a law unto itself. A careful follow-up will convince an operator that no operation as yet devised will cover all cases.

The operation advocated by the speaker tonight, Dr. MacKenty, unquestionably will fulfill the requirements in the largest group of cases which we are called upon to treat. I do not use the lead tape to approximate the flaps as he advises, but suture the muscles together carefully the same as one does any place else in the body where a separation of muscles are to be repaired.

In a series of experiments at Dr. Sweet's Laboratory of Research Surgery at the University of Pennsylvania, Dr. L. Djokowitch and I used every conceivable type of plate, both above and below the suture line, on artifically-produced cleft palates in dogs and found in all cases the object acted as a foreign body delaying or preventing healing. Foreign materials were prone to become infected and were invariably discharge. In contradistinction to this, simple edge to edge suture healed by primary union. In my clinical cases, these facts have been borne out.

The personal element in operating must always be considered. I do not condemn the use of tapes or plates in others. Many report successes as Dr. MacKenty does tonight. I am simply giving my reasons for not using them.

Dr. MacKenty speaks of spreading the lateral incisions. I wonder if he is not pulling out and tearing the tensor palati muscles, thus obtaining relaxation of the palate.

If relaxation is required, why not divide the hamular process? I have here a slide which shows just what happens when this process is divided. You note how the tensor action depends upon the tendon passing around the process and when this is divided, we convert the muscle into an elevator.

I can see no reason for cutting the posterior pillars of the fauces. This pillar is formed, as you know, by the palatopharyngeus muscle which relaxes in swallowing, as the pharynx is elevated.

To my mind, the most pathetic cases are those which have submitted to several operations to obtain a good anatomical result and still speak as badly as they did before any operative procedures were undertaken. These are the types of cases with a congenital short palate and those which originally were of normal length, but have become shortened, due to infection, etc., following many operations.

I have devised a procedure which I feel corrects these defects and with speech training following along after the operation, offers the best chance for obtaining a fair speaking voice.

The operation, in brief, consists of freeing the entire covering of the hard palate by an incision following the contour of the palate. Note in the cut how the incision spreads out posteriorly. The hamular processes are then divided and part of the internal plate of the pterygoid process.

The cut also shows how the entire palate falls back until it rests on the posterior wall of the pharynx.

The first patient I have to show is one who originally had a Langenback operation performed. This gave her a short, rigid palate and failed to improve her speaking voice. I then performed my operation. You will note how long the soft palate appears and you will see that it comes in contact with the posterior wall when she speaks or swallows. In other words, she can now shut off ht enose from the pharynx. I want you to note how pliable the palate is. Dr. Twitmyer, of the Psychological Department of the University of Pennsylvania, in his speech training department has a method of testing the ability to shut off the posterior nares. He places a tube in each nostril and records by means of a needle on a smoked drum any air which passes through the nostrils when various sounds which require complete closure of the pharynx are made.

I have a number of cases where I am satisfied I improved the speaking voice considerably by this operation.

To recapitulate, this operation is indicated in congenitally short palates—whether cleft or not—and in acquired short or stiff palates due to operative measures.

Dr. Robert H. Ivy (closing discussion): I have nothing further to add on plastic surgery of the nose. I have been closely following Dr. Dorrance's work on cleft palate, and believe that he has brought forward something of extreme importance in helping the speech, especially in cases of short soft palate.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

Meeting of May, 1926.

DR. E. L. ROBERTS, *Chairman.* DR. R. J. WARNER, *Secretary.*

Minutes of the meeting of the Nashville Academy of Ophthalmology and Otolaryngology, held in Louisville, May, 1926. Dr. E. L. Roberts, Chairman, presiding; Dr. R. J. Warner, Secretary.

Vincent's Angina of Larynx. Dr. Fred Hasty.

T. S. W., Jr., age 28 months, first developed a white patch under the upper lip opposite the incisors. This rapidly extended to the margin of the gums. From this it extended on around the gums in both directions on to both tonsils and the lower gums.

The condition rapidly cleared up under treatment, but continued to spread for two weeks, when the child developed hoarseness and difficulty in breathing. The difficulty in breathing grew worse very rapidly and a tracheotomy was considered within twenty-four hours after the first hoarseness.

I saw the child the fourth day after after the first difficulty in respiration. The respiration was very labored and rapid, and the child was very hoarse and coughed occasionally, was able to swallow water without much difficulty. There was but little or no swelling in the tissues of the neck and the internist reported that there was some evidence of edema in one lung.

The pulse was estimated to be 160, was regular but weak. A smear and culture made from the lip at the onset of the disease was reported to be very definitely positive for Vincent's angina and negative for diphtheria. A similar report was handed in for culture and smear after the membrane had formed on the tonsils. Two small doses of neosalvarsan had been given at three-day intervals before I saw the child.

I advised a tracheotomy to be done promptly. This was done by one of the consultants. The child rested more quietly, afterwards, but the edema of the lung continued to develop and the child died in about twelve hours after the operation.

At post-mortem a smear made from the membrane found in the larynx was negative to diphtheria, and positive for Vincent's angina.

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